

New species and new records of Solariellidae (Gastropoda: Trochoidea) from Indonesia and Taiwan

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KEYWORDS. Gastropoda, Solariellidae, Indonesia, Taiwan, *Solariella*, *Archiminolia*, *Microgaza*, *Bathymophila*, *Spectamen*, new species.

ABSTRACT. New records of 8 Solariellidae species from Indonesia and Taiwan area are documented, which extend the distribution area of a number of them. 10 new species are described and compared with similar species : *Solariella chodon* n. sp.; *S. enteia* n. sp.; *S. plakhns* n. sp.; *S. chani* n. sp.; *Archiminolia pykte* n. sp.; *A. ostreion* n. sp.; *A. strobilos* n. sp.; *Microgaza konos* n. sp.; *Bathymophila aages* n. sp.; *Spectamen babylonia* n. sp. A short conchological characterization is proposed for each genus *Solariella*, *Archiminolia*, *Microgaza*, *Bathymophila*, *Spectamen*, *Zetela* and *Minolia*.

RESUME. De nouveaux relevés de 8 espèces de Solariellidae provenant d'Indonésie et de Taïwan sont listés, étendant ainsi l'aire de distribution d'un certain nombre d'entre elles. 10 nouvelles espèces sont décrites et comparées avec des espèces similaires : *Solariella chodon* n. sp.; *S. enteia* n. sp.; *S. plakhns* n. sp.; *S. chani* n. sp.; *Archiminolia pykte* n. sp.; *A. ostreion* n. sp.; *A. strobilos* n. sp.; *Microgaza konos* n. sp.; *Bathymophila aages* n. sp.; *Spectamen babylonia* n. sp. Une courte caractérisation conchyliologique est proposée pour chaque genre *Solariella*, *Archiminolia*, *Microgaza*, *Bathymophila*, *Spectamen*, *Zetela* and *Minolia*.

INTRODUCTION

"*Solariella*" species is an intriguing group of Trochoidea, whose systematics seems rather complicated. Within the Solariellidae, some genera are available (*Minolia*, *Microgaza*, *Archiminolia*, *Bathymophila*, *Zetela*, ...), but it is sometimes not obvious to deal with them for concrete studied specimens.

What also makes it rather difficult to study these trochoids is the large amount of nominal species described in the past but poorly known, often known only from the types. The original descriptions dating back from these times are sometimes short, rather superficial, almost without discriminating comparisons with other related species. Moreover, Quinn (1979) has pointed out that the genus *Solariella*, with a large number of subgenera, was formerly used to classify miscellaneous species, some of which were actually not Solariellidae at all but, most often, species belonging to the Talopiini (= Monileini) tribe within the trochid subfamily Umboniinae.

In recent years, several regional studies have been published: Herbert (1987) gave a revision of *Solariella* and related species (especially *Ilanga*) from Southern Africa, Marshall (1999) carried out a similar study for the New Zealand area and Poppe, Tagaro & Dekker (2006) gave an account of *Solariella* species from the Philippine Islands.

But only a few informations are available about the Solariellidae of Indonesia : if Schepman (1908)

described accurately some species, other recent authors mentioned only a few (or even no) solarielline species (e.g. Dharma, 1988, 2005). The situation is similar regarding Taiwan, for which no large revision of Solariellidae exists yet; some books or papers describe or mention only short number of species (Lee & Wu, 2001; Dong, 2002). Some valuable informations are nevertheless available for comparisons in the Japanese works (Kuroda et al, 1971; Higo et al, 1999; Sasaki, 2000. Namikawa et al, 2002) or Australian books (Wilson, 1993). Finally, some poorly known species may be considered using the cards of Kaicher (1987, 1990).

In such a context, it was of high interest to study the huge deep water "*Solariella*" material that is stored in the MNHN (Muséum national d'Histoire naturelle, Paris) as a result of numerous expeditions conducted for the last thirty years (Bouchet et al., 2008), especially those around Taiwan and Indonesia.

The present paper gives a synthetic report on the Solariellidae species collected during two expeditions involving MNHN scientists in eastern Indonesia and Taiwan areas. Besides new records for 8 known species, which sometimes extends their distribution and/or introduces some variability of shell characters, 10 new species are described here.

An attempt is done to propose distinctive conchological features of the genera used for Solariellidae species, based on a collection of opinions of authors that gave objective criteria (Herbert, 1987; Marshall, 1999) and personal observations. Radular

characterization, if known, is also mentioned, based upon the indications from the same authors.

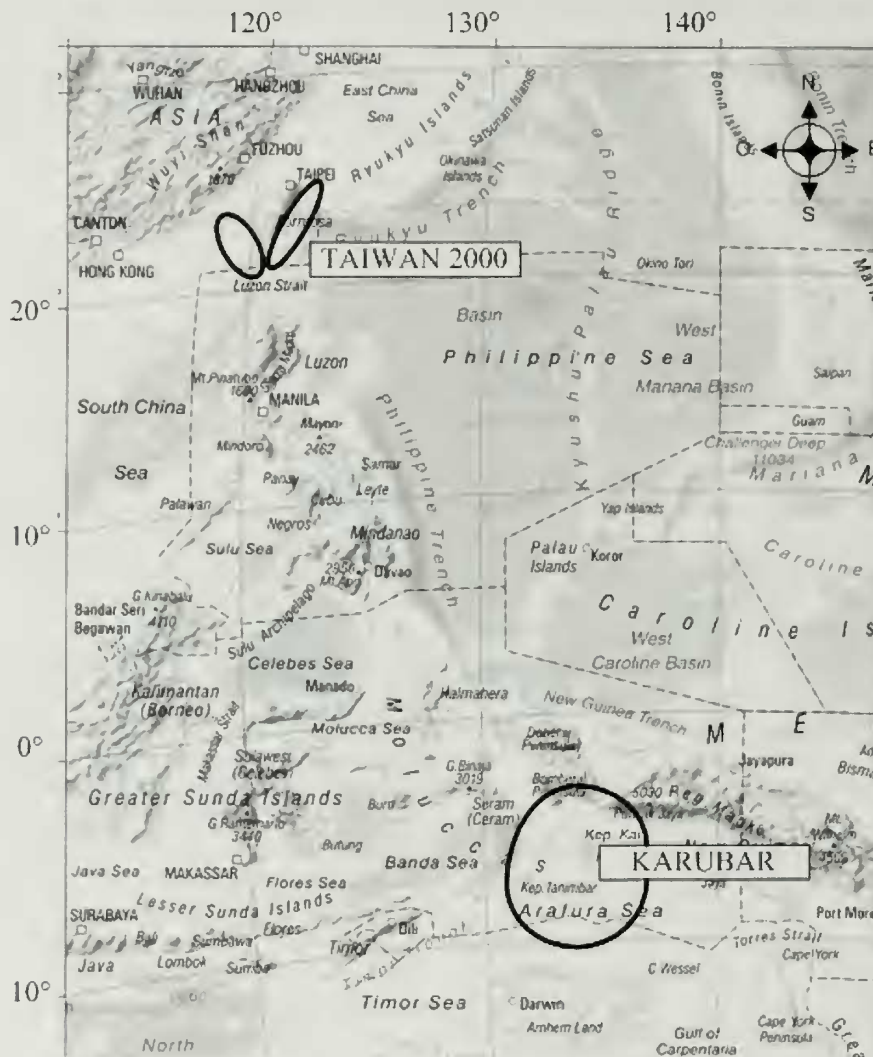
Material and methods

The material studied in this paper was brought by two expeditions : KARUBAR and TAIWAN 2000.

The KARUBAR campaign (after Kai, Aru and Tanimbar Islands) took place in Banda Sea and Arafura Sea, off Kai Islands and Tanimbar Islands, from October 21 to November 5, 1991, as the result of a oceanographic research partnership between Indonesian and French scientists (Crosnier et al, 1997). The purpose of this expedition was to investigate the deep-sea fauna and to look for potential economic resources in the deep-sea benthos (especially shrimps). The campaign occurred on board "Baruna Jaya 1" and was led by Dr Kasim Moosa (P30 LIPI : Pusat Penelitian dan Pengembangan Oseanologi LIPI), with the participation of some of his colleagues of P30 LIPI, of several scientists from BALITKANLAUT (Balai Penelitian Perikanan Laut)

and BPPT (Badan Pengkajian dan Penerapan Teknologi), and some French scientists from ORSTOM (now IRD - Institut de Recherche pour le Développement) and MNHN (Muséum national d'Histoire naturelle). A total of 91 stations (dredge hauls or trawls) were carried out off Kai and Tanimbar Islands, at depths between 200 and 1200 m.

The TAIWAN 2000 campaign took place around south-western and eastern Taiwan, from July 26 to August 4, 2000, as the result of a partnership between the NTOU (National Taiwan Ocean University), the TFRI (Taiwan Fisheries Research Institute), the ORSTOM and the MNHN. The purpose of this campaign was to improve the knowledge of the fauna of the deep-sea benthos. The campaign occurred on board "Fishery Researcher 1" and was led by Dr Ding-An Lee with the active participation of Dr Tin-Yam Cham (National Taiwan Ocean University of Keelung). A total of 53 stations (dredge hauls or trawls) were carried out, at depths between 98 and 3618 m.



Map 1. Prospecting areas surveyed in this paper - approximate locations of TAIWAN 2000 and KARUBAR cruises.

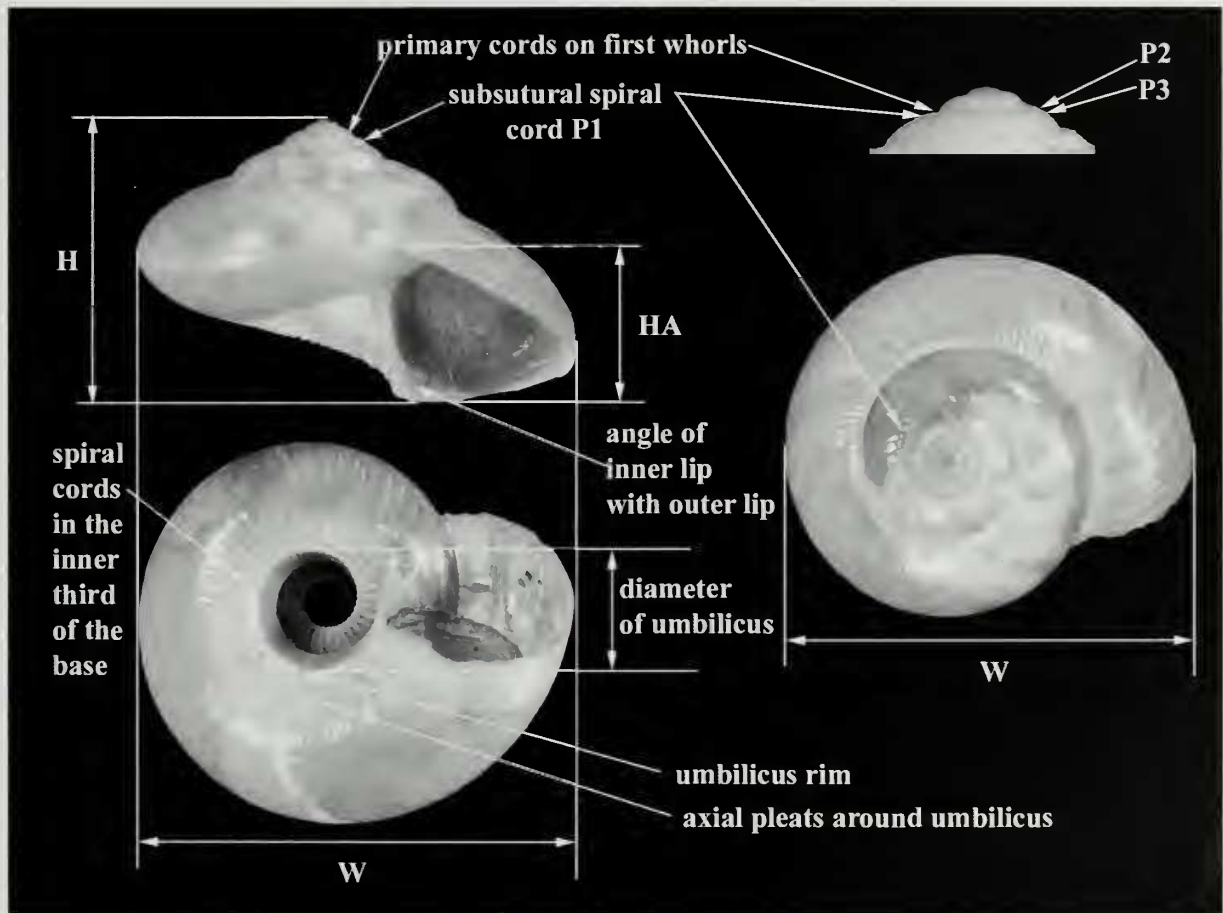
Regarding the distribution of the new species and the extension of the distribution of known species, the range is taken from the internal intervals of the two extremes values.

Regarding the description methodology, the main conchological features used are (see text figure 1 below) :

- ◆ general shape of the shell (depressed, high spired - cyrtoidal, conical, coeloconoidal);
- ◆ shape of the whorls (convex, concave, straight -

with or without shoulder or keel):

- ◆ spiral cords of the whorls (onthogeny, number, beads, strength);
- ◆ spiral cords on the base (number, beads, distance between);
- ◆ rim and spiral cord around the umbilicus, axial pleats at rim (number);
- ◆ axial threads and spiral cords within the umbilicus (number);
- ◆ shape of the aperture, the outer and the inner lip.



Text figure 1. Features of Solariellidae shells; H : height; W : width; HA : height of the aperture; P1, P2, P3, ... : primary cords (shell : *Ilanga biradiatula* (Martens, 1902), North-western Madagascar, VAUBAN 1971-1975, stn CH02).

Abbreviations

Repositories

IRSNB : Institut royal des Sciences naturelles de Belgique, Bruxelles, Belgium.
 MNHN : Muséum national d'Histoire naturelle, Paris, France.
 MZB : Museum Zoologicum Bogorense, Bogor, Indonesia.
 BMNH : Natural History Museum, London, England.
 NMNS : National Museum of Natural Sciences, Taichung, Taiwan

NSMT : National Museum of Science, Tokyo, Japan.
 RMBR : Raffles Museum of Biodiversity Research, Singapore.
 ZMA : Zoologisch Museum, Amsterdam, The Netherlands.

Other abbreviations

H : height
 W : width
 HA : height of the aperture
 TW : number of teleoconch whorls

P1, P2, P3, ... : primary cords (P1 is the most adapical)
 S1, S2, S3, ... : secondary cords (S1 is the most adapical)
 stn : station
 lv : live-taken specimens present in sample
 dd : no live-taken specimens present in sample
 sub : subadult specimen
 juv : juvenile specimen

SYSTEMATICS

We follow here the classification of Bouchet & Rocroi (2005), where Solariellidae, earlier treated as a subfamily of Trochidae (Hickman & McLean, 1990), are now ranked as a family of superfamily Trochoidea, besides true Trochidae and Calliostomatidae.

Superfamily : **TROCHOIDEA** Rafinesque, 1815

Family : **SOLARIELLIDAE** Powell, 1951

[= Minoliinae Kuroda, Habe & Oyama, 1971]

A distinctive conchological feature of Solariellidae is the protoconch of about 1 whorl, with a diameter of usually 250 µm (up to 800 µm) and almost without apical beak : on the contrary, the conchologically similar Umboniinae have a small (diameter < 250µm), beaked protoconch (Herbert, 1987; 1992). The protoconch of the Solariellidae has a straight terminal lip, almost never thickened.

The radula is the most important feature that characterize the group : with a formula usually like 6-10 + (1) + 4 + 1 + 4 + (1) + 6-10, the rachidian has a triangular cusp, the 3 inner laterals have a more or less triangular cusp with denticles on one side only, the fourth lateral is more elongated, a latero-marginal plate can be present, the marginals are always not numerous. For more radular distinctive features and other anatomical characters, see Herbert (1987).

For discussion about justification of the reconized genera within Solariellidae, with an argumentation based on conchological and anatomical considerations (especially radula), see Marshall (1999).

Genus *Solariella* Wood, 1842

Type species: *Solariella maculata* Wood, 1842 (by monotypy) – Pliocene, England.

Distinctive features. The original description of *Solariella* does not really give accurate characteristics that can be used for other species. This is also a problematic taxa because the type species is a fossil, making radula and anatomy not available. From a conchological point of view, recent authors didn't give really a clear definition of the genus that could be discriminant regarding other genera like *Archiminolia*. It seems that what can be said is that the *Solariella* shell is rather small (height up to 12 mm), has a moderately elevated to more or less depressed spire, rather strong spiral sculpture, no colour pattern, a peristome more or less complete, a rather broad, often keeled umbilicus bordered by a margin with or without riblets.

Remarks. Marshall (1999) considered *Machaeroplax* Friele, 1877, *Zeminolia* Finlay, 1926 and *Minolops* Iredale, 1929 as synonyms of *Solariella*.

Solariella mutabilis Schepman, 1908

Figs 1–10

Solariella mutabilis Schepman, 1908: 49, pl. III, fig. 7; pl. IX, fig. 8. Type locality: Indonesia, northern coast of Timor, western entrance Samau Strait, 10°22'.7S, 123°16'.5E, 390 m.

Solariella mutabilis var. *laevior* – Schepman, 1908: 50, pl. III, fig. 7a.

Solariella mutabilis var. *plicifera* – Schepman, 1908: 51, pl. III, fig. 7b.

Zetela mutabilis – Poppe, Tagaro & Dekker, 2006: 138, pl. 75, figs 1-3.

Material examined. Indonesia, western entrance Samau Strait. SIBOGA: stn 059, 10°22'.7S, 123°16'.5'E, 390 m, 2 dd (holotype ZMA 3.08.041 and syntype var. *laevior* ZMA 3.08.042).

Figures 1-16. Scale bars: 1 mm.

1-10. *Solariella mutabilis* Schepman, 1908, MNHN, Indonesia.

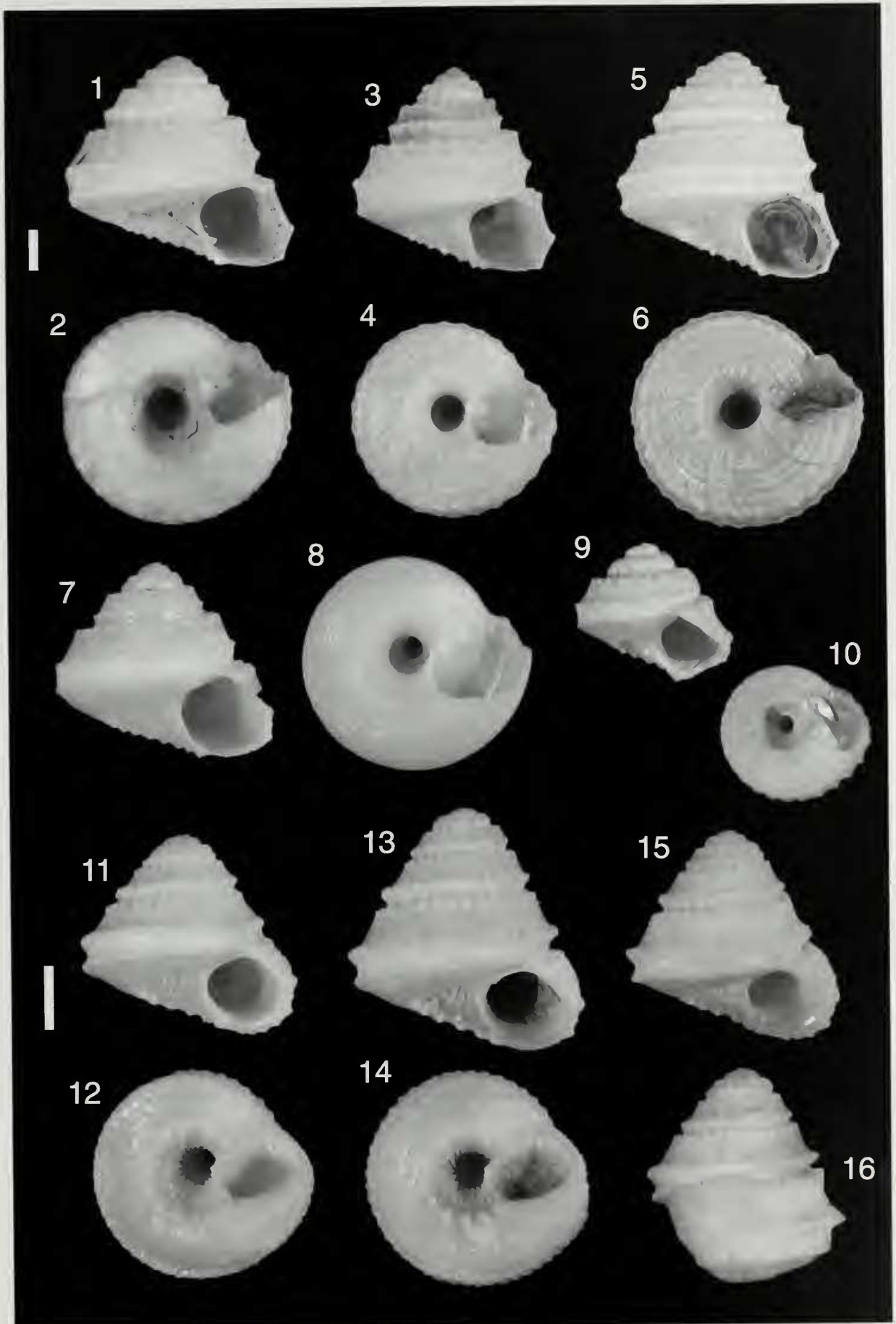
1-2. Holotype ZMA (3.08.041 - Moll. 135804), Western entrance Samau Strait, 390 m [SIBOGA, stn 059], 4.7 x 5.1 mm. **3-6.** Kai Islands, 448-467 m [KARUBAR, stn DW28]. **3-4.** 3.9 x 4.1 mm. **5-6.** 4.7 x 4.6 mm. **7-8.**

Holotype var. *laevior* ZMA (3.08.042 - Moll. 135805), Western entrance Samau Strait, 390 m [SIBOGA, stn 059], 4.2 x 5.0 mm. **9-10.** Holotype var. *plicifera* ZMA (3.08.047 - Moll. 135810), Kai Islands, 304 m [SIBOGA, stn 253], 2.3 x 2.7 mm.

11-16. *Solariella chodon* n. sp., Indonesia, Kai Islands, 181-184 m [KARUBAR, stn DW29].

11-12. Holotype MNHN (MNHN 21427), 3.3 x 3.4 mm. **13-14.** Paratype MNHN (MNHN 21428), 4.3 x 3.6 mm.

15-16. Paratype MNHN (MNHN 21428), 3.2 x 3.1 mm.



Indonesia, Kai Islands. SIBOGA: stn 253, 05°48.2'S, 132°13'E, 304m, 1 dd (syntype var. *plicifera* ZMA 3.08.047). - KARUBAR: stn DW02, 05°47'S, 132°13'E, 209-240 m, 5 dd. - Stn DW03, 05°48'S, 132°13'E, 278-301 m, 10 dd & 3 dd juv. - Stn DW07, 05°46'S, 132°21'E, 283-285 m, 13 dd. - Stn DW15, 05°17'S, 132°41'E, 212-221 m, 1 dd. - Stn DW28, 05°31'S, 132°54'E, 448-467 m, 25 lv.

Indonesia, Tanimbar Islands. KARUBAR: stn DW44, 07°52'S, 132°48'E, 291-295 m, 180 lv. - Stn DW50, 07°59'S, 133°02'E, 184-186 m, 1 dd.

Philippines, Aliguay Island. Local trawlers, 140-160 m, coll. C.Vilvens.

Distribution. Eastern Indonesia, 186-522 m, living at 295-448 m (Schepman, 1908 and present data); Philippines, 52-516 m (Poppe et al, 2006).

Remarks. The main characteristics of this species are :

- height up to 6 mm, width up to 5 mm;
- a moderately high spire, a slightly cyrtococonoidal shape, with up to 5 whorls;
- 4 granular spiral cords; P1 subsutural, the strongest, granular to nodular, producing a first keel; P3 slightly less strong than P1 but much stronger than P2, sometimes smooth (form *laevior*) but usually granular, producing keel under the middle of rib (ca. at 3d fifth); P2 very weaker than P1 and P3, poorly visible on intermediate whorls, more visible on last whorl; P4 only visible on last whorl, slightly weaker than P3; some additional tertiary cords between primary cords on last whorl;
- an almost flat base, with 5 smooth spiral cords and a thick granular cord around the umbilicus;
- a broad umbilicus with weak spiral cords and axial riblets inside;
- a yellowish colour.

Solariella mutabilis is very seldom cited and very seldom illustrated (see the poor list of references above). As the Latin name suggests it, this seems to be a relatively variable species : Schepman described and illustrated two varieties, based on nearly smooth area between primary cords (variety *laevior*) and more depressed spire with stronger axial riblets on the whorls (variety *plicifera*), although the latter has only 3 whorls and seems to be a subadult specimen. The three specimens from the Philippines illustrated by Poppe et al. (2006) show also a great variability. The specimens illustrated in the present work show also some variations (see Figs 3-6), with a moderately to relatively elevated spire and spiral cords strong to weaker, especially the tertiary cords between primary cords. Constant features of all the shells examined are the dome-shaped first whorl, the cyrtococonoidal shape of the spire and the cords on the base : there are always 5 smooth spiral cords and a thick granular cord around the umbilicus.

Poppe et al. (2006) consider that this species belongs to genus *Zetela*, basing their opinion on similarities with *Z. variabilis* Dell, 1956. But *Solariella mutabilis* does not fit the criterias of *Zetela* given by Marshall (1999).

Solariella chodon n. sp.

Figs 11-16, Table 1

Type material. Holotype (3.3 x 3.4 mm) MNHN (MNHN 21427). Paratypes: 15 MNHN (MNHN 21428), 2 RMBR (ZRC.MOL.2876), 2 MZB (MZB.Lam.1990), 1 coll. C.Vilvens.

Type locality. Indonesia, Kai Islands, KARUBAR, stn DW29, 05°36'S, 132°56'E, 181-184 m.

Material examined. Indonesia, Kai Islands, KARUBAR: stn DW29, 05°36'S, 132°56'E, 181-184 m, 28 dd (with holotype and 19 paratypes).

Distribution. Indonesia, Kai Islands, 181-184 m (dead).

Diagnosis. A solarielline species with a relatively to rather elevated, weakly cyrtococonoidal to conical bell-shaped spire, a subsutural nodular spiral cord and a granular spiral cord making keel under the middle of the whorl, a broad umbilicus with an angulate, nodular rim and up to 6 weak, thin, smooth spiral cords on the base.

Description. *Shell* of small size for the genus (height up to 4.3 mm, width up to 3.6 mm), wider than high or higher than wide, rather thick, weakly cyrtococonoidal, more or less bell-shaped; spire more or less elevated, height 0.9x to 1.2x width, 3.1x to 4.3x aperture height; angulate periphery; umbilicus rather broad and rather deep.

Protoconch 180 to 190 µm wide, of 1 whorl, moderately rounded, with two thin spiral threads, a small, weak apical beak and a thin, straight terminal lip.

Teleoconch of up to 4.9 whorls, first whorls convex, other almost flat, with axial threads, subsutural shoulder and two main spiral cords producing keel.

Suture visible, not canaliculated.

First whorl convex, sculptured by thin axial riblets and 4 cords appearing immediately, subgranular by intersection with axial threads; interspace between threads 1.5x to 2 larger than threads; P2 and P3 slightly stronger than other cords at end of whorl; suture weakly canaliculated.

On second whorl, P2 and P3 thickening, granular, producing a keel; P1 the weakest, obsolete, disappearing at end of whorl; P4 covered by next whorl; axial threads broader and more prosocline.

On third whorl, beads of P3 becoming sharp, horizontally oriented; beads of P2 blunt, adapically oriented; distance between P2 and P3 twice and even

3 times distance between P3 and P4; P3 very prominent, giving a concave shape to areas between P2 and P3 and between P3 and P4; axial threads weakening, more visible near beads; suture no more canalculated.

On last whorl, P4 peripheral, granular, slightly weaker than P3; at end of whorl, up to 5 very thin, subgranular tertiary spiral cords may appear between P2 and P3, as well as 1 tertiary cord between P3 and P4.

Aperture circular to subcircular, compressed at apical part by base; peristome complete; outer lip

thickened,

Base weakly convex to almost flat, without axial threads and with up to 6 thin, weak, smooth spiral cords (some of them nearly invisible on some specimens) and a much stronger, granular spiral cord bordering umbilicus, with strong and sharp beads.

Umbilicus broad, diameter measuring ca. 30% of shell width, funnel shaped, bordered by an angulate rim, with lamellose axial threads and 3 or 4 thin spiral cords inside.

Colour of teleoconch greyish with brownish flames; protoconch off-white.

	TW	H	W	HA	H/W	H/HA
holotype	4.6	3.3	3.4	0.9	0.97	3.67
paratype MNHN 1	4.6	4.3	3.6	1.0	1.19	4.30
paratype MNHN 2	4.9	3.2	3.1	0.8	1.03	4.00
paratype MNHN 3	4.5	3.1	3.3	0.8	0.94	3.88
paratype MNHN 4	4.5	3.0	3.3	0.7	0.91	4.29
paratype MNHN 5	4.4	3.2	3.2	0.9	1.00	3.56
paratype RMBR 1	4.6	3.1	3.3	0.8	0.94	3.88
paratype RMBR 2	4.5	3.1	3.2	0.9	0.97	3.44
paratype ZMB 1	4.5	3.1	3.3	1.0	0.94	3.10
paratype ZMB 2	4.5	3.2	3.0	0.9	1.07	3.56
paratype CV	4.3	3.2	3.3	0.8	0.97	4.00
<i>means</i>	4.5	3.3	3.3	0.9	0.99	3.79

Table 1. – *Solariella chodon* n. sp. : Shells measurements in mm for some types.

Discussion. The bell-shaped shell and the prominent abapical keel make *Solariella chodon* n. sp. hard to confuse with other species from the same area, except rather close *S. mutabilis* (Figs 1–10) from the same area of Indonesia, but this taller species has not a dome-shaped spire, P1 (not P2) as subsutural cord, P3 not so prominent and smaller, more crowded nodules around the umbilicus.

Etymology. Bell (Ancient Greek : $\chi\omicron\delta\omicron\nu$), used as a noun in apposition - with reference to the bell-like shape of the shell.

Solariella euteia n. sp.
Figs 17-20, Table 2

Type material. Holotype (6.0 x 6.0 mm) MNHN (MNHN 21429). Paratype MNHN (MNHN 21430).

Type locality. Indonesia, Tanimbar Islands, KARUBAR, stn CP86, 09°26'S, 131°13'E, 223-225 m, 1 dd.

Material examined. Indonesia, Tanimbar Islands, KARUBAR: stn DW80, 09°37'S, 131°02'E, 199-

201 m, 1 dd, 1 dd juv (with paratype) . – Stn CP86, 09°26'S, 131°13'E, 223-225 m, 1 lv (holotype).

Distribution. Indonesia, Tanimbar Islands, 201-223 m, living at 223-225 m.

Diagnosis. A solarielline species with an elevated, conical spire, a subsutural nodular spiral cord and a spiral cord making keel under the middle of the whorl, subgranular at mid spire and finally smooth, a very broad umbilicus with an angulate, nodular rim and up to 6 thin spiral cords on the base.

Description. *Shell* of medium size for the genus (height up to 6.7 mm, width up to 6.0 mm), height greater or equal to width, rather thin, conical; spire rather elevated, height 1.0x to 1.2x width, 5.0x to 5.2x aperture height; angulate periphery; umbilicus broad and deep.

Protoconch 220 to 250 μ m wide, of 1 whorl, rounded, translucent, with 4 very thin spiral threads and a straight, poorly visible terminal lip.

Teleoconch of 5 to 5.6 weakly convex whorls with weak axial threads (stronger in some areas), subsutural shoulder and mainly 2 strong spiral cords producing keel.

Suture visible, canalculated on first whorls only.

First whorl convex, without axial threads and with 3 smooth spiral cords P1, P3 and P4 appearing immediately, continuing spiral threads of protoconch; P2 absent; interspace between P1 and P3 much larger than distance between P3 and P4; suture channelled.

On second whorl, P1 subgranular, at the edge of angulate channel rim; P3 still smooth, prominent; P4 covered by next whorl; axial threads appearing, mainly visible in adapical part, especially in subsutural area.

On third whorl, P1 stronger than P3, nodular with sharp, adapically oriented nodules; P3 subgranular at begin of whorl; suture no more canalculated.

On fourth whorl, P3 subgranular or nearly smooth; at end of whorl, 4 or 5 thin, smooth, tertiary cords appearing between P1 and P3, 1 or 2 between P3 and P4.

On last whorl, P4 peripheral, nearly smooth, slightly weaker than P3; P3 smooth.

Aperture subcircular; peristome incomplete; outer lip with weak thickening, joining inner lip with an obtuse angle.

Base weakly convex, with up to 6 thin, smooth spiral cords (external ones may be obsolete) and a broader, nodular spiral cord bordering umbilicus; nodules somewhat sharp.

Umbilicus very broad, diameter measuring ca. 45% of shell width, funnel shaped, bordered by an angulate rim, without spiral cords and with very weak axial threads inside.

Colour of teleoconch pinkish nacreous; protoconch off-white.

Operculum corneous, circular, multispiral with a short growing edge, brown.

	TW	H	W	HA	H/W	H/HA
holotype	5.6	6.0	6.0	1.2	1.00	5.00
paratype	5.0	6.7	5.5	1.3	1.22	5.15

Table 2. – *Solariella euteia* n. sp. : Shells measurements in mm for types.

Discussion. Considering its conical shape, *Solariella euteia* n. sp. may be compared only to *S. mutabilis* (Figs 1–10) from the same area of Indonesia, but this similar in size species has a cyrtocoenoidal, not so high spire, a cord P2 weak but present and some spiral cords inside the umbilicus.

Etymology. Straight (Ancient Greek : εὐθύς, εἶα, υ) - with reference to conical, straight shape of the shell.

Solariella plakhus n. sp.

Figs 21-25, Table 3

Type material. Holotype (3.2 x 3.7 mm) NMNS (NMNS-6042-001). Paratypes: 1 MNHN (MNHN 21437), 1 NMNS (NMNS-6042-002).

Type locality. Taiwan, South-eastern Taiwan, TAIWAN 2000, stn DW44, 22°47'N, 121°27'E, 442 m.

Material examined. Taiwan, South China Sea. TAIWAN 2000: stn DW44, 22°47'N, 121°27'E, 442 m, 3 lv (holotype and paratypes).

Distribution. Only known from the type locality.

Diagnosis. A solarielline species with a rather depressed spire, a nodular adapical spiral cord on the subsutural shoulder and a subgranular spiral cord making keel under the middle of the whorl, a broad umbilicus with an angulate, granular rim and 6 thin spiral cords on the base.

Figures 17-30. Scale bars: 1 mm.

17-20. *Solariella euteia* n. sp., Indonesia, Tanimbar Islands.

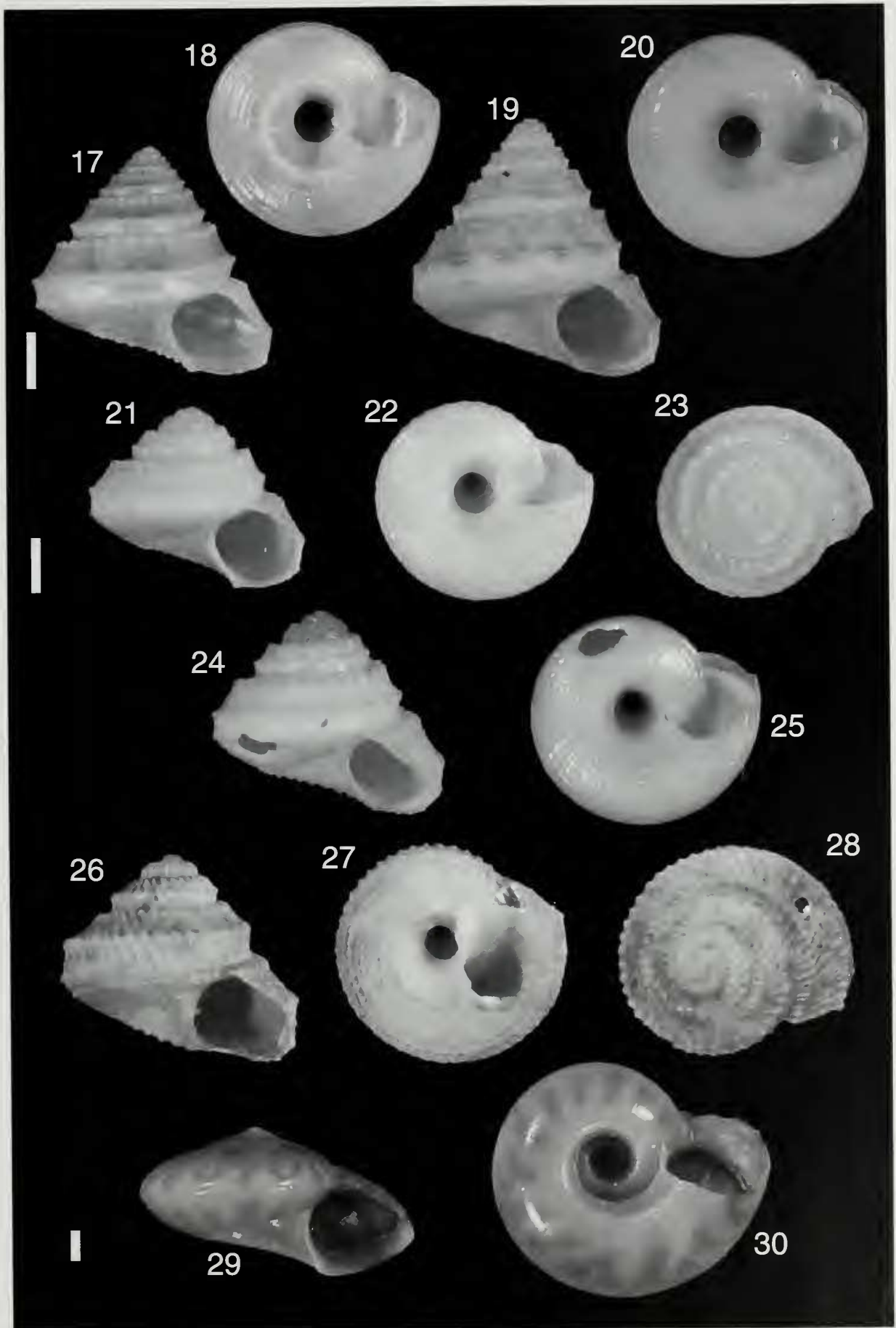
17-18. Holotype MNHN (21429), 223-225 m [KARUBAR, stn CP86], 6.0 x 6.0 mm. **19-20.** Paratype MNHN (21430), 199-201 m [KARUBAR, stn DW80], 6.7 x 5.5 mm.

21-25. *Solariella plakhus* n. sp., Taiwan, South China Sea, 442 m [TAIWAN 2000, stn DW44].

21-23. Holotype NMNS (NMNS-6042-001), 3.2 x 3.7 mm. **24-25.** Paratype MNHN (MNHN 21437), 3.5 x 4.0 mm.

26-28. *Solariella chani* n. sp., Taiwan, South China Sea, 420 m [TAIWAN 2000, stn DW37], holotype NMNS (NMNS-6043-001), 3.4 x 4.1 mm.

29-30. *Archiminolia zaccaloides* (Schepman, 1908), MNHN, Indonesia, Tanimbar Is., 206-210 m [KARUBAR, stn DW49], 4.7 x 8.5 mm.



Description. *Shell* of small size for the genus (height up to 3.5 mm, width up to 4.0 mm), wider than high, rather thin, cyrtocoidal; spire rather depressed, height 0.8x to 0.9x width, 2.5x to 2.9x aperture height; angulate periphery; umbilicus broad and deep.

Protoconch 240 to 280 µm wide, of 1 whorl, rounded, nearly smooth, with a rather thin, straight terminal lip.

Teleoconch of 4 to 4.3 convex whorls with weak axial threads, adapical shoulder and spiral cords, two of them producing keel.

Suture visible, weakly canaliculated on first whorls only.

First whorl convex, sculptured by 4 smooth spiral cords appearing immediately; interspace between cords slightly larger than cords; suture weakly channelled; P1 slightly stronger than other cords, at the edge of angulate channel rim; thin axial threads may be poorly visible.

On second whorl, P1 and P3 much stronger than P2, interspace between P2 and P3 quickly larger than between P1 and P2; P3 producing a second keel; P4 covered by next whorl; axial threads broader, more visible especially in subsutural area; P1 weakly

granular at end of whorl, nodules produced by crossing of cord by axial folds.

On third whorl, P1 clearly nodular with rounded nodules; P2 very weak; P3 weakly subgranular; prosocline, low, large axial folds clearly visible on whole surface; S1 and S2 appearing at end of whorl, as weak as P2; suture only weakly canaliculated.

On last whorl, P4 peripheral, nearly smooth, slightly weaker than P3; S3 appearing; suture no more canaliculated.

Aperture subcircular; peristome incomplete; outer lip without thickening, joining inner lip with an obtuse angle.

Base moderately convex, with 6 thin, weak, smooth spiral cords and a broader, granular spiral cord bordering umbilicus.

Umbilicus broad, diameter measuring ca. 30% of shell width, funnel shaped, bordered by an angulate rim, with 5 smooth spiral cords and very weak axial threads inside.

Colour of teleoconch pinkish white; protoconch off-white.

Operculum corneous, circular, multispiral with a short growing edge, light brown.

	TW	H	W	HA	H/W	H/HA
holotype	4.0	3.2	3.7	1.1	0.86	2.91
paratype MNHN	4.3	3.5	4.0	1.2	0.88	2.92
paratype NMNS	4.1	2.8	3.6	1.1	0.78	2.55

Table 3. - *Solarieella plaklus* n. sp.: Shells measurements in mm for types.

Discussion. *Solarieella plaklus* n. sp. is close to *S. mutabilis* (Figs 1–10), but this slightly taller species has a higher spire, P2 and P4 much weaker than P1 and P3 on the first whorls (P2 even disappearing on some specimens), an almost flat base with 5 (not 6) smooth, clearly visible (not very thin and low) spiral cords and sharper beads on the cord around the umbilicus. The two species were found in a sema station (DW44) without intermediate specimens.

The new species is also rather close to *Zetela dedonderum* Poppe, Tagaro & Dekker, 2006 (Figs 82–83) from the Philippines, but this slightly taller species has a higher spire with a higher H/W ratio, 5 (not 6) thicker spiral cords on the base and thicker beads on the cord around the umbilicus.

Etymology. Cake (Ancient Greek : *πλαχους*), used as a noun in apposition - with reference to the shape of the shell, evoking small cakes like muffins.

Figures 31–44. Scale bar = 1 mm.

31–34. *Archiminolia fulgens* Dall, 1907.

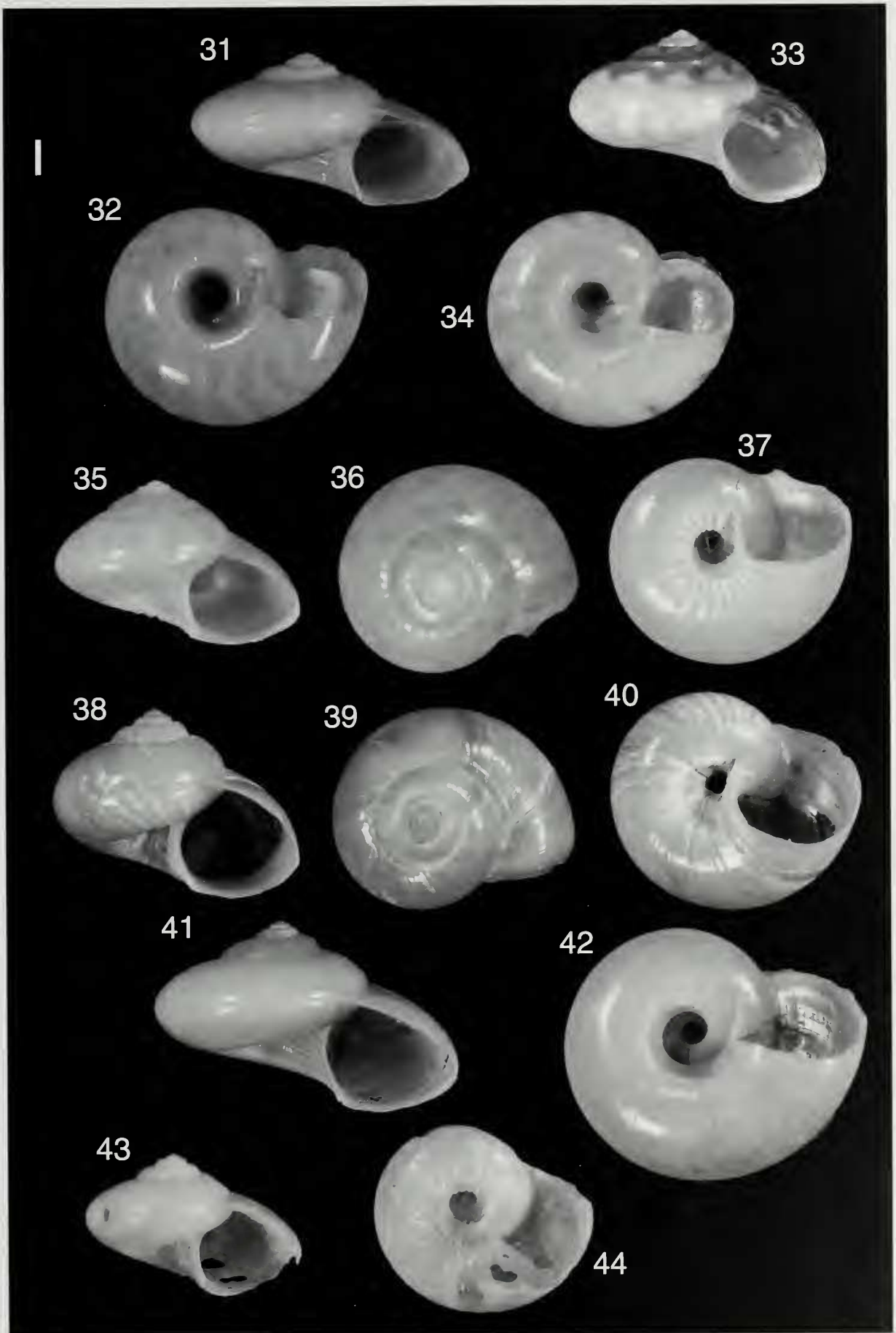
31–32. MNHN, Indonesia, Kai Is. 156–305 m [KARUBAR, stn DW01], 5.3 x 9.2 mm. **33–34.** Japan, 90–180 m, 5.5 x 9.1 mm, coll. C. Vilvens.

35–37. *Archiminolia ptykte* n. sp., holotype MNHN (MNHN 21431), Indonesia, Kai Is., 209–240 m [KARUBAR, stn DW02], 5.2 x 8.1 mm.

38–40. *Archiminolia strobilos* n. sp., holotype NMNS (NMNS-6045-001), Taiwan. 532 m [TAIWAN 2000, stn DW60]. 6.5 x 7.9 mm.

41–42. *Ilanga aquamarina* (Melvill, 1909), syntype BMNH (1910.3.17.6), Indian Ocean (Saya de Malha Bank), 265 m, 6.3 x 10.9 mm.

43–44. *Ilanga incisura* (Melvill, 1909), syntype BMNH (1910.3.17.8), Indian Ocean (Saya de Malha Bank), 265 m, 3.2 x 5.2 mm.



Solariella chani n. sp.
Figs 26-28

Type locality. Taiwan, South China Sea, TAIWAN 2000, stn DW37, 21°52'N, 120°36'E, 420 m.

Material examined. Taiwan, South China Sea. TAIWAN 2000: stn DW37, 21°52'N, 120°36'E, 420 m, 1 dd (holotype).

Distribution. Only known from the type locality.

Diagnosis. A small Solarielline species with a moderately depressed spire, a surface covered by strong prosocline threads, two nodular spiral cords, the adapical cord on the subsutural shoulder and the abapical cord making keel under the middle of the whorl, a broad umbilicus with an angulate, granular rim and 6 thin spiral cords on the base.

Description. *Shell* of small size for the genus (height 3.4 mm, width up to 4.1 mm), wider than high, rather thin, weakly cyrtocoidal; spire rather depressed, height 0.8x width, 3x aperture height; angulate periphery; umbilicus broad and deep.

Protoconch 500 µm wide, of 1 whorl, rounded, with an irregular surface, a thin spiral cord, an weak apical beak and a straight terminal lip.

Teleoconch of 3.3 convex whorls with string, lamellose axial threads, adapical shoulder and spiral cords, two of them producing keel.

Suture visible, not canaliculated.

First whorl convex, sculptured by 4 thin, smooth spiral cords appearing immediately and rather strong, rounded, weakly prosocline axial threads, thicker than cords; interspace between threads 2x to 2.5x larger than threads; P1 and P3 slightly stronger than other cords at end of whorl.

On second whorl, P3 much stronger other cords, producing a keel; P1 at the edge of angulate channel rim; P2 the weakest, disappearing after mid whorl; P4 covered by next whorl; axial threads broader and more prosocline.

On third whorl, axial threads somewhat lamellose; P3 still stronger than P1; S1 and S2 appearing between P1 and P3.

On last whorl, P4 peripheral, granular, slightly weaker than P3 and P1; S4 very thin, subgranular.

Aperture subcircular; peristome incomplete.

Base moderately convex, with axial threads and 6 thin, weak, smooth spiral cords and a very broad, granular spiral cord bordering umbilicus with strong and sharp beads.

Umbilicus broad, diameter measuring ca. 30% of shell width, funnel shaped, bordered by an angulate rim, with 4 smooth spiral cords and very weak axial threads inside.

Colour of teleoconch white with brownish flames; protoconch off-white.

Type material. Holotype (3.4 x 4.1 mm) NMNS (NMNS-6043-001).

Discussion. Considering its plicate axial sculpture, *Solariella chani* n. sp. may be compared only to *S. mutabilis* (Figs 1-10), but this slightly taller species has a higher spire, a smaller protoconch (diameter of about 200 µm), a much weaker axial sculpture (even considering the variety *plicifera* that has mainly visible axial threads on the last whorl only) and only 5 spiral cords on the base without axial sculpture,

Etymology. At the request of Dr Philippe Bouchet (MNHN), this new species is named after Dr Tin-Yam Chan (National Taiwan Ocean University, Keelung), the initiator of deep-sea benthic exploration of Taiwan.

Genus *Archiminolia* Iredale, 1929

Type species: *Monilea oleacea* Hedley & Petterd, 1907 (by original designation) – Recent, eastern Australia.

Distinctive features. The *Archiminolia* species have a moderately elevated spire the spire of the rather close *Microgaza* species are more depressed). Fine spiral cords are present on the whorls of the teleoconch, weakening on the last whorls; the subsutural cord is sometimes nodular. The umbilicus is always open (sometimes covered by a thin septum, but not filled by a callus as it is for *Bathymophila* species) and not very broad (narrower than umbilicus of *Microgaza*). A broad latero-marginal plate is present in the radula.

Archiminolia fulgens (Dall, 1907)

Figs 31-34

Microgaza fulgens Dall, 1907: 168. Type locality: Sea of Japan, 10°22'.7S, 123°16'.5E, 390 m.

Microgaza fulgens – Kuroda, Habe & Oyama, 1971: 42, pl. 12, figs. 15-16.

Microgaza fulgens – Kaicher, 1986: card TR3-4569.

Microgaza fulgens – Higo, Callomon & Goto, 1999: 65.

Archiminolia fulgens – Marshall, 1999: 24.

Microgaza fulgens – Sasaki, 2000: 77, pl. 38, fig. 114.

Microgaza fulgens – Poppe, Tagaro & Dekker, 2006: 129, pl. 68, fig. 3.

Material examined. Indonesia, Kai Islands. KARUBAR: stn DW01, 05°46'S, 132°10'E, 156-305 m, 4 lv & 1 lv juv. – Stn DW28, 05°31'S, 132°54'E, 448-467 m, 25 lv. - Stn DW29, 05°36'S, 132°56'E, 181-184 m, 28 dd.

Indonesia, Tanimbar Islands. KARUBAR: stn CP80, 09°37'S, 131°02'E, 199-201 m, 1 dd.

Taiwan, South China Sea. TAIWAN 2000: stn DW34, 22°02'N, 120°36'E, 246 m, 1 dd. – Stn CP58, 24°35'N, 122°06'E, 221 m, 1 lv.

Distribution. Japan, 50-350 m; Eastern Indonesia, 184-448 m, living at 305-448 m; South China Sea, 221-246 m, living at 221 m; Philippines, 82-356 m (range computed using material of Poppe et al, 2006, but these authors considered *Archiminolia zaccalooides* (Schepman, 1908) as a synonym of *A. fulgens* – see discussion under *A. zaccalooides*).

Remarks. The main characteristics of this species are :

- height up to 6 mm, width up to 12 mm;
- a rather depressed spire, a slightly cyrtocoidal shape with a rounded periphery, with up to 5 convex whorls;
- numerous thin, very weak, smooth spiral cords; suture slightly canaliculate; very weak axial plicae at the upper part of whorls;
- a smooth, convex base;
- a broad umbilicus with a rounded rim, about 5 or 6 spiral cords and weak axial riblets inside;
- a brownish colour, with a subsutural and a peripheral spiral line of interrupted brown and white spots.

Authors refer to this species as *Microgaza fulgens*, but we follow here Marshall (1999) who assign it to *Archiminolia*.

Archiminolia ptykte n. sp.

Figs 35-37, Table 4

Type material. Holotype (5.2 x 8.1 mm) MNHN (21431). Paratype MNHN (21432).

Type locality. Indonesia, Kai Islands, KARUBAR, stn DW02, 05°47'S, 132°13'E, 209-240 m.

Material examined. Indonesia, Kai Islands, KARUBAR : stn DW02, 05°47'S, 132°13'E, 209-240 m, 1 dd (holotype) & 3 dd juv. – Stn DW31, 05°40'S, 132°51'E, 288-289 m, 1 dd (paratype).

Distribution. Indonesia, Kai Islands, 240-288 m (dead).

Diagnosis. A Solarielline species with a rather depressed spire, smooth spiral cords on first whorls, subsutural low granular cord on next whorls, last

whorls smooth, a rather narrow umbilicus with an angulate rim and about 20 axial grooves around it.

Description. *Shell* of moderate size for the genus (height up to 5.2 mm, width up to 8.2 mm), wider than high, thin, conical, polished; spire rather depressed, height 0.6x width, 4.7 to 5.1x aperture height; periphery subangular; umbilicus deep and rather narrow.

Protoconch 300 to 350 µm wide, of 1 whorl, rounded, with minute, widely spaced granules, a very small apical beak, a thin, straight terminal lip.

Teleoconch of 4.2 weakly convex whorls without axial threads, with adapical shoulder and smooth spiral cords on first whorls, disappearing on next whorls.

Suture visible, weakly canaliculated on first whorls only.

First whorl convex, sculptured by 5 thin, spiral cords appearing almost immediately; interspace between adapical cords larger than between abapical cords; suture only weakly channelled; P2 slightly stronger than other cords, at the edge of angulate channel rim.

On second whorl, spiral cords stronger and more evenly spaced; interspace between cords slightly broader than other cords; subsutural shoulder already vanishing; P1 becoming granular at end of whorl, with low, broad, poorly marked beads while other cords becoming obsolete; sutural channel rim rounded.

On third whorl, all spiral cords disappeared at mid whorl except P1 still granular; channel rim disappearing.

On last whorls, P1 vanishing and disappeared at mid fourth whorl; suture no more canaliculated.

Aperture subelliptic; peristome incomplete; outer lip without thickening, joining inner lip with an obtuse angle.

Base moderately convex, smooth; about 20 axial grooves in the inner third, defining wide, strong, low pleats forming at rim a granular spiral cord bordering umbilicus.

Umbilicus rather narrow, diameter measuring ca. 20% of shell width, funnel shaped, bordered by an angulate rim, with 6 spiral cords and axial threads inside.

Colour of teleoconch uniformly white nacreous; protoconch off-white.

	TW	H	W	HA	H/W	H/HA
holotype	4.2	5.2	8.1	1.1	0.64	4.73
paratype	4.2	5.1	8.2	1.0	0.62	5.10

Table 4. - *Archiminolia ptykte* n. sp. : Shells measurements in mm for types.

Discussion. *Archiminolia ptykte* n. sp. may be compared to some solarielline species, regardless the current genus of these ones. The new species is rather close to *Ilanga incisura* Melvill, 1909 (Figs 43-44) from the Indian Ocean (Saya de Malha Bank), but this much smaller species has more convex whorls giving

a very different, not conical shape to the spire, a canaliculate suture and thinner smooth (instead subgranular) spiral cords inside the umbilicus.

Archiminolia ptykte n. sp. is also rather close to *Microgaza norfolkensis* Marshall, 1999 from Norfolk Island but this larger species is more depressed, has

more convex whorls, much thinner and more numerous axial pleats in the inner quarter of the base. The new species may be compared to *Ilanga aquamarina* (Melville, 1909) (Figs 41–42) also from Saya de Malha Bank, but this slightly larger species has a more depressed spire, a weaker subsutural granular spiral cord already disappearing at third whorl, more numerous and narrower axial pleats around the umbilicus, a broader umbilicus with thinner and more numerous spiral cords inside.

Etymology. Pleated (Ancient Greek: πτυχτός) - with reference to the strong axial ribs around the umbilicus of the shell.

Archiminolia zaccaloides (Schepman, 1908)
Figs 29–30

Solariella zaccaloides Schepman, 1908: 48–49, pl. III, fig. 6. Type locality: Indonesia, Buton Strait, 04°20'S, 122°58'E, 75–94 m.

Solariella zaccaloides – Dong, 2002: 96–97, fig. 87, pl. II.

Solariella zaccaloides – Poppe, Tagaro & Dekker, 2006: 130.

Material examined. Indonesia, Kai Islands. KARUBAR: stn DW01, 05°46'S, 132°10'E, 156–305 m, 1 dd. – Stn DW22, 05°22'S, 133°01'E, 85–124 m, 1 dd juv. – Stn DW28, 05°31'S, 132°54'E, 448–467 m, 1 dd & 2 dd sub.

Indonesia, Tanimbar Islands. KARUBAR: stn DW49, 08°00'S, 132°59'E, 206–210 m, 9 lv & 1 lv sub. – Stn DW50, 07°59'S, 133°02'E, 184–186 m, 2 lv & 1 lv sub. – Stn CP67, 08°58'S, 132°06'E, 146–233 m, 1 lv. – Stn CP80, 09°37'S, 131°02'E, 199–201 m, 3 dd & 3 dd sub.

Distribution. Eastern Indonesia, 94–448 m, living at 186–206 m (Schepman, 1908 and present data); Taiwan, 100–162 m (Zengzhi, 2002).

Remarks. This species is close to *A. fulgens* Dall, 1907 (Figs 31–34). Poppe et al (2006) consider this species as a synonym of *A. fulgens*, but I don't really

agree with this opinion, because it seems that there are objective differences between the two species: *A. zaccaloides* has a more conical shape with less convex whorls, usually a more triangular aperture and a sharp, not rounded, rim around the umbilicus. *Microgaza gotoi* Poppe, Tagaro & Dekker, 2006 (Figs 57–61) from Philippines belongs to another genus and differs from these two species by a bigger size for the same number of whorls, a more depressed spire, a very broad umbilicus and a horizontally elongated aperture.

Archiminolia olivaceostrigata (Schepman, 1908)
Figs 45–48

Solariella olivaceostrigata Schepman, 1908: 47–48, pl. III, fig. 5. Type locality: Indonesia, 05°34.5'S, 119°40'E, 522 m.

Material examined. Indonesia, Kai Islands. KARUBAR: stn DW03 (Iles Kai), 05°48'S, 132°13'E, 278–301 m, 3 dd juv.

Indonesia, Tanimbar Islands. KARUBAR: stn CP05, 05°49'S, 132°18'E, 296–299 m, 1 dd & 1 dd sub.

Distribution. Eastern Indonesia, 299–522 m (Schepman, 1908 and present data).

Remarks. The main characteristics of this species are:

- height up to 9.5 mm, width up to 11.5 mm;
- a rather elevated spire, a more or less conical shape with a rounded periphery, with up to 6 convex whorls;
- 6 thin, smooth spiral cords on the first whorls, vanishing on the next ones except the subsutural cord first granular and finally disappearing on the last whorls; suture slightly canalculated on first whorl, only marked on the next ones;
- a smooth, convex base, with axial crenulations around the umbilicus;
- a broad umbilicus with a rounded rim, without spiral cords and with very weak axial riblets inside;
- a whitish colour, with prosocline oliva threads.

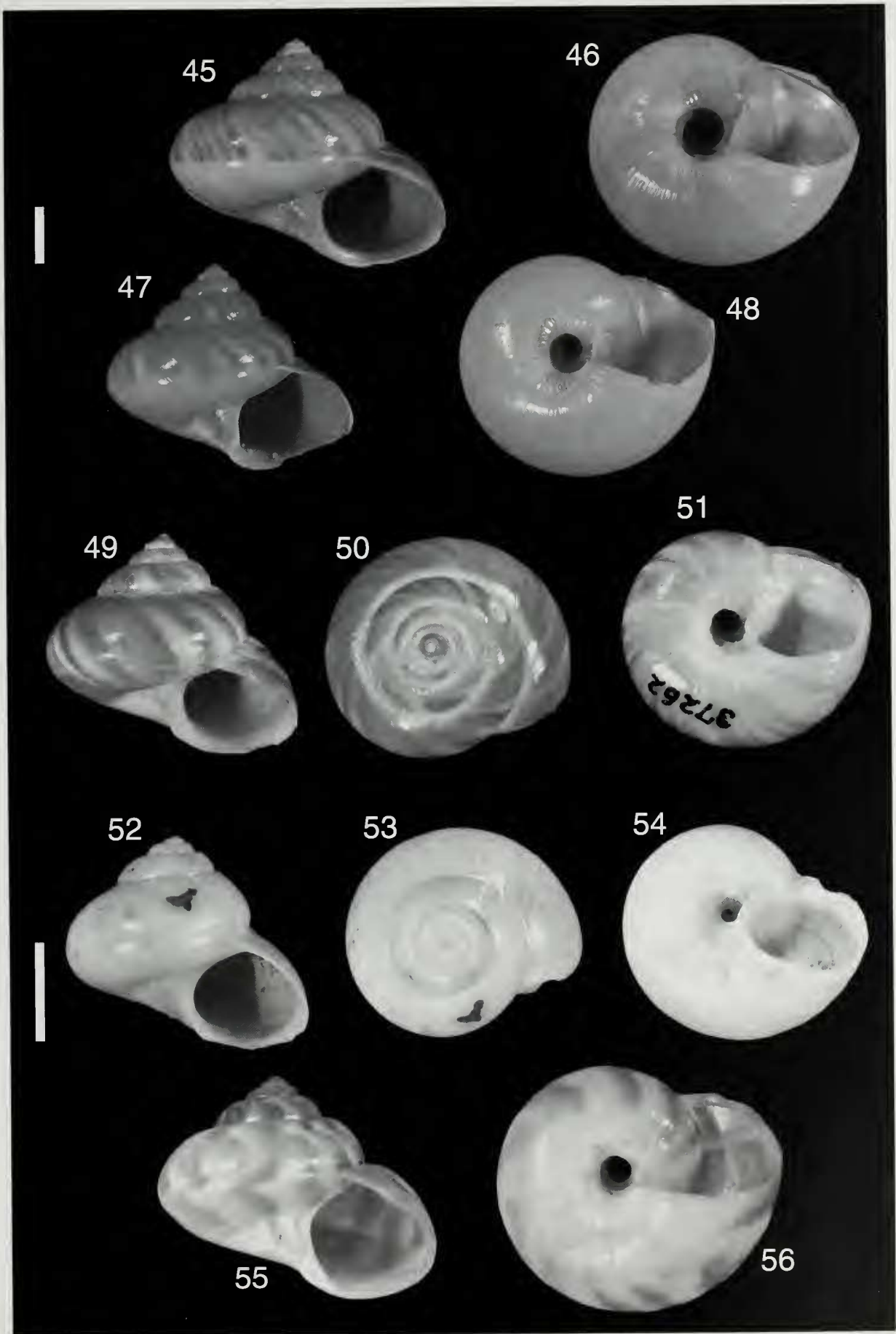
Figures 45–56. Scale bars = 5 mm.

45–48. *Archiminolia olivaceostrigata* (Schepman, 1908), MNHN, Indonesia. Tanimbar Is. 206–210 m [KARUBAR, stn CP05]. 45–46. 19.4 x 23.1 mm. 47–48. 14.7 x 16.7 mm.

49–51. *Archiminolia katoi* (Kuroda & Habe in Habe, 1961), holotype NSMT (Mo 37262). Japan, 200–300 m, 16.4 x 17.6 mm.

52–54. *Archiminolia ostreion* n. sp., holotype NMNS (NMNS-6044-001), Taiwan. [TAIWAN 2000, stn DW37], 10.1 x 11.6 mm.

55–56. *Archiminolia ziczac* Kuroda & Habe, 1971 in Kuroda, Haba & Oyama, 1971, holotype NSMT (Mo R17663), Japan, 65–110 m, 11.0 x 14.1 mm



Archiminolia ostreion n. sp.

Figs 52–54, Table 5

Type material. Holotype (10.1 x 11.6 mm) NMNS (NMNS-6044-001). Paratype MNHN (MNHN 21438).

Type locality. Taiwan, TAIWAN 2000, stn DW37, 21°52'N, 120°36'E, 420 m.

Material examined. Taiwan, TAIWAN 2000: stn DW37, 21°52'N, 120°36'E, 420 m, 1 dd (holotype). – Stn DW44, 22°47'N, 121°27'E, 442 m, 1 dd (paratype) & 1 dd sub.

Distribution. Taiwan, 420–442 m (dead).

Diagnosis. A solarielline species with a rather elevated spire, smooth spiral cords on first whorls, a subsutural low granular cord on next whorls disappearing on the last whorl, a smooth base and a rather narrow umbilicus with a weak round keel and without spiral cords inside.

Description. *Shell* of moderate size for the genus (height up to 10.1 mm, width up to 11.6 mm), wider than high, thin, slightly cyrtocoenoidal, polished; spire rather elevated, height 0.8 to 0.9x width, 1.9x aperture height; rounded periphery; umbilicus deep and rather broad.

Protoconch 300 µm wide, of 1 whorl, rounded,

somewhat translucent and with a thin, straight terminal lip.

Teleoconch of 5 convex whorls without axial threads, with adapical shoulder and smooth spiral cords on first whorls, disappearing on next whorls.

Suture visible, weakly canalculated on first whorls only.

First whorl convex, sculptured by 4 thin, evenly spaced spiral cords appearing almost immediately; suture only weakly channelled; P1 at the edge of angulate channel rim.

On second whorl, spiral cords stronger; sutural channel rim rounded.

On third whorl, axial threads in subsutural area; all spiral cords disappearing at begin of whorl except P1 becoming granular with low, broad, poorly marked beads; channel rim disappearing and subsutural shoulder vanishing.

On fourth whorl, P1 vanishing and finally disappearing at fifth whorl; suture no more canalculated.

Aperture elliptic, vertically oriented; peristome incomplete; outer lip without thickening; inner lip weakly thickened.

Base convex, smooth; very weak axial threads in the inner third.

Umbilicus moderately broad, diameter measuring ca. 25% of shell width, funnel shaped, bordered by an poorly marked, rounded rim, with very weak axial threads and without spiral cords inside.

Colour of teleoconch uniformly white nacreous; protoconch translucent.

	TW	H	W	HA	H/W	H/HA
holotype	5.0	10.1	11.6	5.2	0.87	1.94
paratype	4.7	7.5	9.2	3.9	0.82	1.92

Table 5. - *Archiminolia ostreion* n. sp. : Shells measurements in mm for types.

Figures 57-71. Scale bars = 5 mm.

57-61. *Microgaza gotoi* Poppe. Tagaro & Dekker.

57-58. MNHN, Indonesia, Kai Islands. 181-184 m [KARUBAR, stn DW28], 6.1 x 11.5 mm. **59-61.** Philippines, 150-300 m, coll. C. Vilvens, 7.8 x 6.1 mm.

62-63. *Microgaza coroua* Lee & Wu, 2001, MNHN, Indonesia, Tanimbar Islands, 443-468 m [KARUBAR, stn DW28], 5.4 x 8.6 mm.

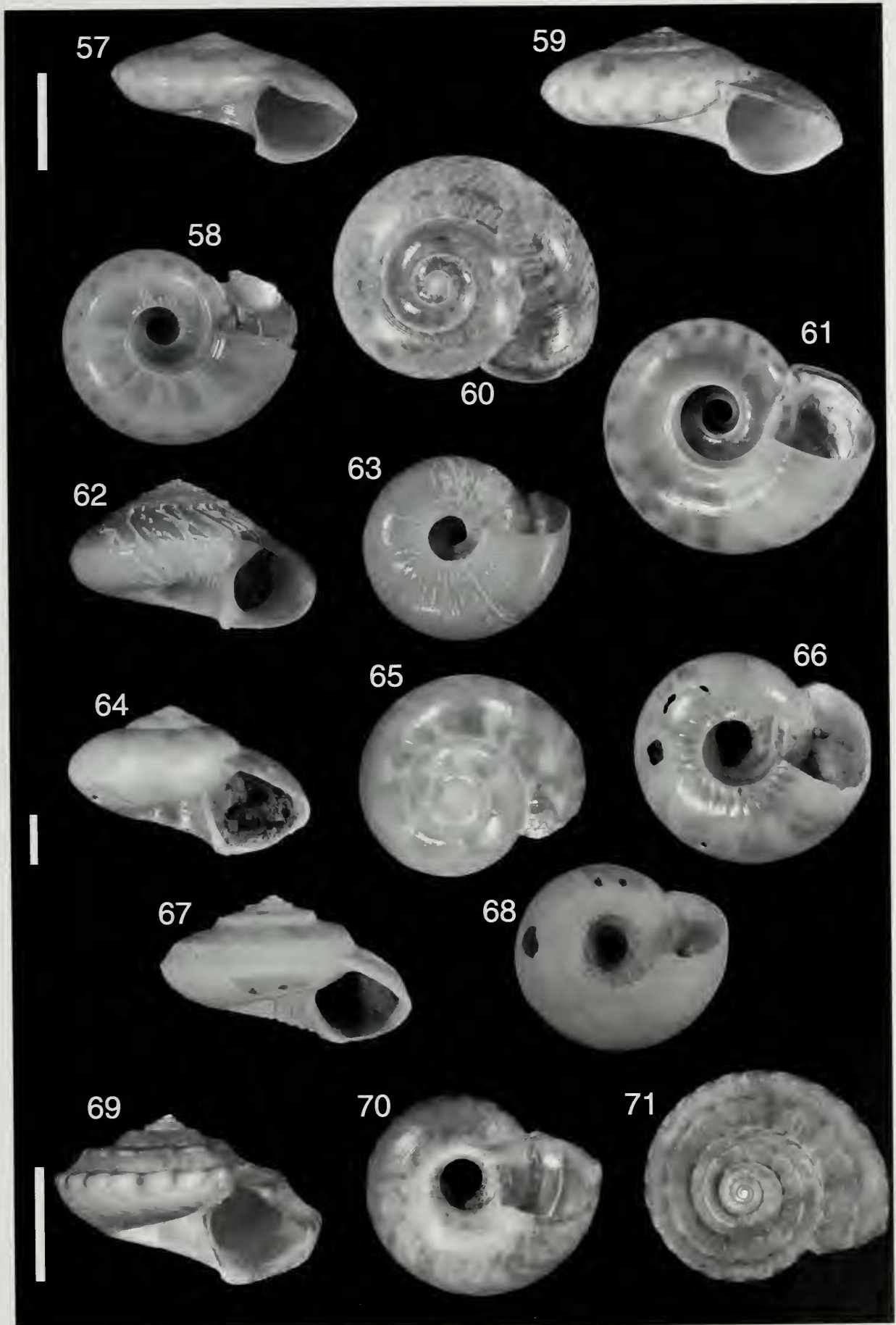
Scale bar = 1 mm.

64-66. *Microgaza kouos* n. sp., holotype NMNS (NMNS-6046-001), Taiwan, Bashi channel, 305 m [TAIWAN 2000, stn DW36], 3.3 x 6.1 mm

67-68. *Ilanga* sp., MNHN, Indonesia, Tanimbar Is., 179-180 m [KARUBAR, stn DW64], 3.5 x 6.0 mm.

Scale bar = 5 mm.

69-71. *Ilanga bicarinata* (Adams & Reeve, 1850), holotype BMNH (1879.2.26.186), "Eastern seas", 7.9x12.1 mm



Discussion. *Archiminolia ostreion* n. sp. is rather close to *A. katoi* (Kuroda & Habe in Habe, 1961) (Figs 49-51) from Japan, but this slightly larger species has only 4 spiral cords on first whorls, a stronger subsutural spiral cord, an umbilicus with a keeled rim with numerous weak spiral cords inside.

The new species may also be compared to *Archiminolia ziczac* (Kuroda & Habe, 1971 in Kuroda, Haba & Oyama, 1971) (Figs 55-56) from Japan, but this similar in size species has a more depressed spire, 5-6 (instead only 4) thin smooth spiral cords on the first whorls, a more horizontally elongated aperture, a pinkish light brown colour with articulated bands of brown and white, two columellar callus (that recall the columella of *Monilea*-like species (Talopini, Umboniinae)).

The new species seems moderately close to *Archiminolia opalina* (Shikama & Hayashi in Shikama, 1977) of which the type was not available; fide the original description, this Japanese species is more depressed, has less convex whorls giving a triangular shape to the shell and a keeled umbilicus with a granular spiral cord around it.

Etymology. Oyster (Ancient Greek : οστρεϊον), used as a noun in apposition - with reference to the mother of pearl giving the nacreous colour to the the shell.

Archiminolia strobilos n. sp.

Figs 38-40, Table 6

Type material. Holotype (6.5 x 7.9 mm) NMNS (NMNS-6045-001). Paratypes: 3 MNHN (MNHN 21439), 2 NMNS (NMNS-6045-002), 2 RMBR (ZRC.MOL.2877), 1 coll. C.Vilvens.

Type locality. Taiwan, North-eastern Taiwan, TAIWAN 2000, stn DW60, 24°41'N, 122°12'E, 532 m.

Material examined. Taiwan, TAIWAN 2000: stn DW60, 24°41'N, 122°12'E, 532 m, 5 lv & 30 dd (with holotype and 8 paratypes).

Distribution. Only known from the type locality.

Diagnosis. A solarielline species with a moderately elevated spire, without spiral cords on first whorls

except a subsutural one that becomes stronger and granular on next whorls and obsolete on the last whorl, a smooth base and a rather narrow umbilicus with a weak round keel and without spiral cords inside.

Description. *Shell* of moderate size for the genus (height up to 7.2 mm, width up to 9.3 mm), wider than high, rather thin, conical to slightly cyrtocoidal, highly polished; spire moderately elevated, height 0.8 to 0.9x width, 2.1 to 2.5x aperture height; rounded periphery; umbilicus deep and rather narrow.

Protoconch about 300 µm wide, of 1 whorl, rounded, with minute granules and a thin, almost indistinct straight terminal lip.

Teleoconch of up to 4.5 convex whorls without axial threads but with prosocline growing lines, with a subsutural spiral cord on penultimate whorls, obsolete on last whorl.

Suture visible, canaliculated except on last whorl.

First whorl convex, smooth except a thin, smooth subsutural spiral cord and some minute granules; suture weakly channelled.

Between mid and end of second whorl, one or two thin suprasutural spiral cords appearing; suture more strongly canaliculated; P1 stronger, at the edge of angulate channel rim.

On third whorl, one or two thin additional intermediate spiral cords may appear; axial threads in adapical half area, making a weak reticulate pattern; P1 stronger and granular.

On fourth whorl, all spiral cords disappearing at begin of whorl except P1 still granular with clearly defined beads; suture still canaliculate.

On last whorl, P1 obsolete and finally disappearing; suture no more canaliculated.

Aperture slightly elliptic, vertically oriented; peristome incomplete; outer lip without thickening; inner lip weakly thickened.

Base convex, smooth (very weak and thin spiral threads on some specimens).

Umbilicus rather narrow, diameter measuring ca. 15 to 20% of shell width, funnel shaped, bordered by a poorly marked, rounded rim, with thin axial threads (those near inner lip may be thicker and more widely spaced) and without spiral cords inside.

Colour of teleoconch and protoconch pinkish nacreous; umbilical area whitish.

	TW	H	W	HA	H/W	H/HA
holotype	4.4	6.5	7.9	2.7	0.82	2.41
paratype MNHN 1	4.8	7.2	8.6	3.0	0.84	2.40
paratype MNHN 2	4.4	7.1	9.3	3.0	0.76	2.37
paratype MNHN 3	4.4	6.9	8.3	2.9	0.83	2.38
paratype NMNS 1	4.4	6.8	8.6	2.7	0.79	2.52
paratype NMNS 2	4.5	6.6	8.5	2.8	0.78	2.36
paratype RMBR 1	4.2	6.3	7.7	3.0	0.82	2.10
paratype RMBR 2	4.4	7.1	8.2	2.8	0.87	2.54
paratype CV	4.2	6.3	7.7	2.5	0.82	2.52
<i>means</i>	<i>4.4</i>	<i>6.8</i>	<i>8.3</i>	<i>2.8</i>	<i>0.81</i>	<i>2.40</i>

Table 6. - *Archiminolia strobilos* n. sp. : Shells measurements in mm for types.

Discussion. By its small protoconch, *Archiminolia strobilos* n. sp. seems rather close to *Archiminolia dawsoni* (Marshall, 1979) and *Archiminolia hurleyi* (Marshall, 1979) both from Kermadec Ridge (both foremost considered as *Microgaza* species by their author), but these species have a higher spire, at least 6 spiral cords on the first whorl and different colour pattern; moreover, the latter has 9 widely spaced spiral threads inside the umbilicus.

Etymology. Spiral shell, spinning top (Ancient Greek : στροβίλοζ), used as a noun in apposition - with reference to the general helical shape of the shell.

Genus *Microgaza* Dall, 1881

Type species: *Microgaza rotella* Dall, 1881 (by monotypy) – Recent, West Indies.

Distinctive features. The *Microgaza* species have a depressed spire. Fine spiral cords are present on the first whorls of the teleoconch, weakening on the next whorls except sometimes a nodular subsutural one. The umbilicus is always open (without any septum, as it can occur in *Archiminolia* and without covering callus as it can appear in *Bathymophila*) and very broad (broader than in *Archiminolia*). A broad latero-marginal plate is present in the radula.

Microgaza gotoi Poppe, Tagaro & Dekker, 2006
Figs 57–61

Microgaza gotoi Poppe, Tagaro & Dekker, 2006: 130-131, pl. 69, figs 4-5. Type locality: Philippines. Aliguay Island, 50-200 m.

Material examined. Indonesia, Kai Islands. KARUBAR: DW29, 181-184 m, 05°36'S, 132°56'E, 2

dd, 1 dd sub & 4 dd juv.

Distribution. Philippines 50-200 m; Eastern Indonesia, 181-184 m (dead).

Remarks. The main characteristics of this species are :

- height up to 12.5 mm, width up to 15.5 mm;
- a moderately elevated spire, a slightly cyrtocooidal shape with a rounded periphery, with up to 6.5 convex whorls;
- 5-6 fine spiral cords on the first whorls, all almost disappearing on the next ones;
- a convex, smooth base;
- a deep, moderately broad umbilicus with a rounded rim;
- a brownish colour, usually with 3 spiral bands of interrupted light brown and white spots.

As already mentioned, this species is rather close to *A. zaccaloides* (Kuroda & Habe, 1961) (Figs 29-30), but *M. gotoi* is larger for a similar number of whorls, has a more depressed spire and a more horizontally elongated aperture.

Microgaza corona Lee & Wu, 2001
Figs 62–63

Microgaza corona Lee & Wu, 2001: 12, figs 4°-4C. Type locality: South China Sea, Pratas Island, 400-500 m.

Material examined. Indonesia, Tanimbar Islands. KARUBAR: stn CC40, 07°46'S, 132°31'E, 443-468 m, 1 dd.

Distribution. South China Sea (Pratas Island), 400-500 m; Eastern Indonesia, 443-468 m.

Remarks. The main characteristics of this species are :

- height up to 5.5 mm, width up to 8.5 mm;
- a moderately depressed spire, a conical to slightly cyrtococonoidal shape with a rounded periphery, with up to 5 very weakly convex whorls;
- a subsutural, granular spiral cord on all the whorls;
- a convex, smooth base with axial ribs and two granular spiral cords around the umbilicus;
- a deep, smooth inside, moderately broad umbilicus with a keeled, granular rim;
- a cream to brownish iridescent colour.

This species was only known from the type locality and this single record extends its distribution.

Microgaza konos n. sp.

Figs 64-66

Type material. Holotype (3.3 x 6.1 mm) NMNS (NMNS-6046-001).

Type locality. Taiwan, Bashi channel, TAIWAN 2000, stn DW36, 21°55'N, 120°36'E, 305 m.

Material examined. Taiwan. TAIWAN 2000: stn DW36, 21°55'N, 120°36'E, 305 m, 1 dd.

Distribution. Only known from the type locality.

Diagnosis. A solaricelline species with a rather depressed spire, whorls nearly smooth except weak low axial pleats, a rather wide umbilicus with an angulate rim and about 20 axial grooves around it.

Description. *Shell* of small size (height up to 3.3 mm, width up to 6.1 mm), wider than high, thin, conical to weakly cyrtococonoidal, polished; spire moderately depressed, height 0.5x width, 3.0x aperture height; periphery rounded; umbilicus deep and rather wide.

Protoconch 200 µm wide, of 1 whorl, smooth, rounded, without apical beak, with a straight terminal lip.

Teleoconch of 4 slightly convex whorls, without shoulder, with very thin smooth spiral cords on first whorls disappearing on next whorls, and thin axial threads.

Suture visible, weakly canaliculated on first whorls only.

First whorl convex, sculptured by 4 thin, evenly spaced, spiral cords appearing immediately; suture channelled; P2 slightly stronger than other cords, at the edge of angulate channel rim.

On second whorl, spiral cords disappearing at mid whorl, P2 the last present; very weak prosocline threads appearing at mid whorl; sutural channel rim rounded.

On third whorl, axial threads thicker becoming low pleats, interspace similar in size to pleats; channel rim disappearing.

On last whorl, axial threads weakening but still present, entirely traversing whorl; suture no more canaliculated.

Aperture broadly triangular; peristome incomplete; outer lip without thickening, joining inner lip with an obtuse angle.

Base moderately convex, axial threads obsolete; about 20 axial grooves in the inner quarter, defining wide, low pleats bordering umbilicus.

Umbilicus wide, diameter measuring ca. 30% of shell width, steep-sided, bordered by an angulate rim, with 6 spiral cords and without axial threads inside.

Colour of teleoconch yellowish brown; adapical third of two last whorls covered by a spiral band alternating dark and light irregular patches; base lighter without maculation, grooves darker; protoconch off-white.

Discussion. *Microgaza konos* is rather close to *M. norfolkensis* Marshall, 1999 from off Norfolk Island, but this species has a larger protoconch (about 400 µm), axial pleats obsolete in the abapical part of the last whorls and very more numerous axial grooves around the umbilicus.

The new species also weakly resembles to *M. navakaensis* Ladd, 1982 from Vanuatu (Fossil), but this species has a beaded subsutural spiral cord and more numerous axial grooves around the umbilicus.

Etymology. Cone (Ancient Greek : κωνος), used as a noun in apposition - with reference to the conical shape of spire.

Figures 72-85. Scale bars = 1 mm.

72-74. *Bathymophila aages* n. sp., holotype MNHN (MNHN 21433), Indonesia, Kai Is, 305 m [KARUBAR, stn DW02], 4.6 x 5.3 mm.

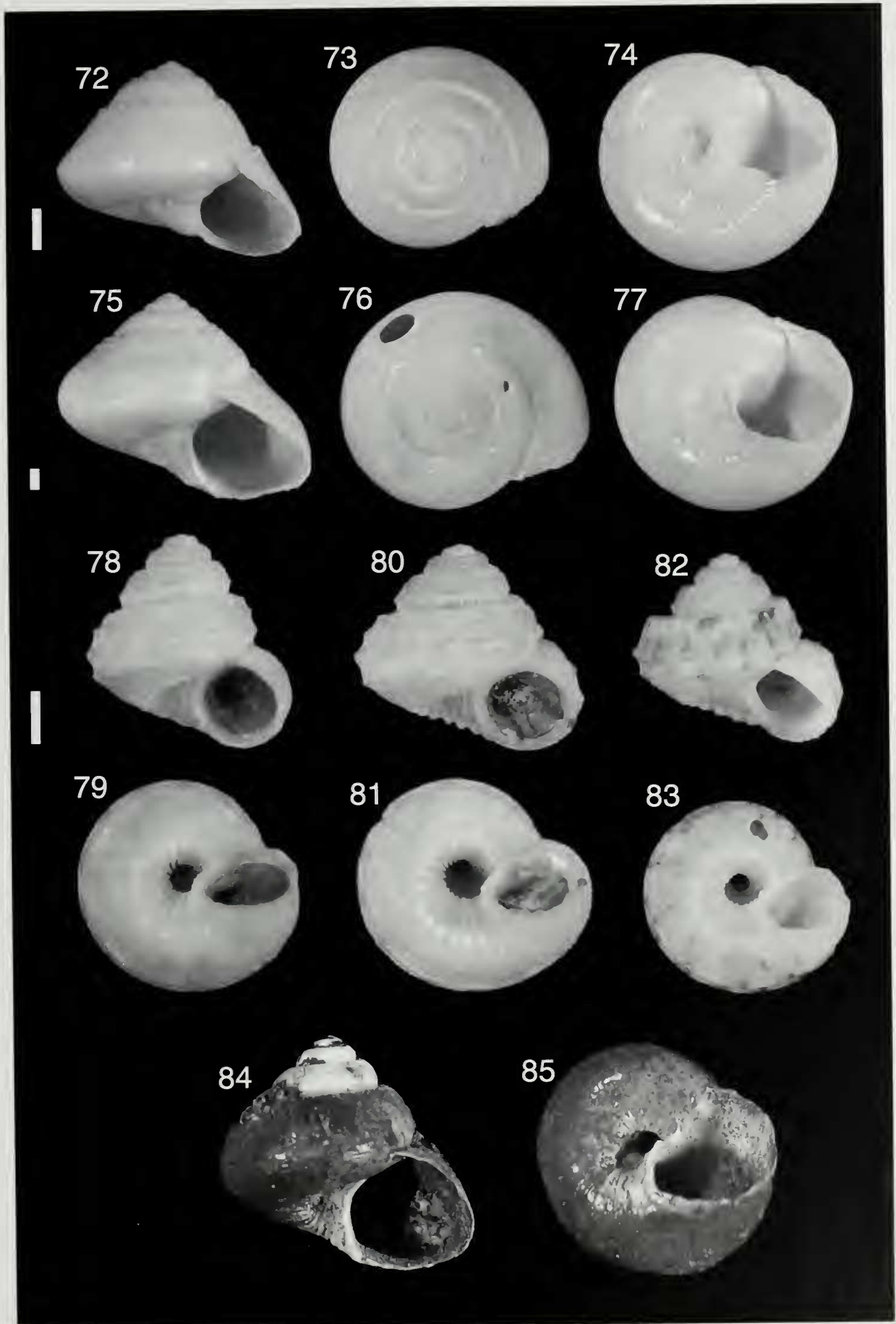
75-77. *Bathymophila gravida* Marshall, 1999. MNHN, Vanuatu, 650-719 m [MUSORSTOM 8, stn DW1063], 7.3 x 8.8 mm.

78-81. *Spectamen babylonia* n. sp., Indonesia, Kai Islands, 205-212 m [KARUBAR, stn DW18]. **62-63.**

Holotype MNHN (MNHN 21435), 3.9 x 3.6 mm. **64-65.** Paratype MNHN (MNHN 21436), 3.6 x 3.6 mm.

82-83. *Zetela dedonderum* Poppe, Tagaro & Dekker, 2006, paratype MNHN (Moll. 5367), Philippines, 60-100m, 3.1 x 3.6 mm.

84-85. *Zetela* sp., MNHN, Taiwan, South China Sea, 463 m [TAIWAN 2000, stn DW45], 5.0 x 5.1 mm.



Genus *Ilanga* Herbert, 1987

Type species: *Trochus laevissimus* Martens, 1881 (by original designation) – Recent, South Africa.

Distinctive features. It seems not easy to separate *Ilanga* from *Microgaza* based only on conchological features; but the radula of *Microgaza* has well-developed latero-marginal plates while the radula of *Ilanga* lacks these plates. The *Ilanga* species have a depressed spire and the whorls are sometimes shouldered. Spiral cords may be present present, fine or sometimes stronger, or nearly absent. The aperture is usually circular to ovate (it is more triangular in *Microgaza*). The umbilicus is deep, always open to apex (without any septum nor callus) and relatively wide (broader than in *Archiminolia*, narrower than in *Microgaza*).

Ilanga sp.

Figs 67-68

Material examined. Indonesia, Tanimbar Islands. KARUBAR: stn DW64, 09°13'S, 132°31'E, 179-180 m, 2 dd.

Discussion. These shells are very eroded and no spiral or axial sculpture can be seen. So, it is impossible to describe the ontogeny of cords. It seems that the shells belong to the genus *Ilanga* (or maybe *Microgaza*), resembling *Ilanga bicarinata* (Adams & Reeve, 1850) (Figs 69-71) from "eastern seas", *Ilanga kilburni* Herbert, 1987 and especially *Ilanga undata* (Sowerby, 1870), both from South Africa.

Genus *Bathymophila* Dall, 1881

Type species: *Margarita (Bathymophila) euspira* Dall, 1881 (by monotypy) – Recent, Atlantic.

Distinctive features. The *Bathymophila* species have a moderately depressed to elevated spire. Fine spiral cords are present on the first whorls of the teleoconch; they vanish on the next whorls, giving a smooth surface, except usually the clearly nodular subsutural cord. The narrow umbilicus is always filled by a strong callus with basal swellings. A latero-marginal plate is present in the radula, with as specific feature a terminal linear projection.

Bathymophila aages n. sp.

Figs 72-74, Table 7

Type material. Holotype (4.6 x 5.3 mm) MNHN (MNHN 21433). Paratypes: 3 MNHN (MNHN 21434), 2 MZB (MZB.Lam.1991), 2 RMBR (ZRC.MOL.2878), 1 coll. C.Vilvens.

Type locality. Indonesia, Kai Is., KARUBAR, stn DW02, 05°47'S, 132°13'E, 209-240 m.

Material examined. Indonesia, Kai Islands. KARUBAR: stn DW15, 05°17'S, 132°41'E, 212-221 m, 2 dd. – Stn DW02, 05°47'S, 132°13'E, 209-240 m, 18 dd (with holotype and paratypes) & 4 dd juv.

Tanimbar Islands. KARUBAR: stn DW07, 05°46'S, 132°21'E, 283-285 m, 1 dd & 1 dd juv.

Taiwan. TAIWAN 2000: stn DW34, 22°02'N, 120°36'E, 246 m, 1 dd.

Distribution. Eastern Indonesia, 221-283 m; Taiwan, 246 m (dead).

Diagnosis. A massive, white polished species with a moderately elevated spire, a nodular subsutural cord on last whorl and a moderately wide umbilicus partly covered by a thick callus with three swellings on its columellar part.

Description. *Shell* of small size (height up to 4.8 mm, width up to 5.7 mm), wider than high, rather thick, weakly cyrtconoidal, polished; spire moderately elevated, height 0.8x to 0.9x width, 2.4x to 3.4x aperture height; subangular periphery; umbilicus moderately wide, filled by thick callus.

Protoconch 250 µm wide, of 1 whorl, smooth with one or two suprasutural spiral threads, rounded, without apical beak, with a rounded, slightly thickened terminal lip.

Teleoconch up to 4.8 whorls; first whorls convex, last whorls only weakly convex, all with narrow subsutural ramp; thin smooth spiral cords on two first whorls, disappearing on next whorls, and a nodular subsutural cord on last whorls.

Suture visible, canaliculated on first whorls only.

First whorl convex, sculptured by 6 thin, evenly spaced, spiral cords appearing immediately, adapical cords slightly stronger; suture channelled; sutural ramp with P1 at the edge of angulate channel rim.

On second whorl, spiral cords weakening; weak axial threads appearing on subsutural ramp.

On third whorl, axial threads and spiral cords disappearing except cord at rounded ramp, enlarging and producing large rounded nodules at mid whorl; suture no more canaliculated.

On last whorl, nodules weakening, sometimes almost disappearing.

Aperture subcircular, weakly transversally elongated; peristome incomplete; outer lip without thickening, inner lip fused with umbilical callus.

Base only weakly convex, smooth on outer part, about 25 axial grooves in the inner third, defining low pleats bordering umbilicus.

Umbilicus moderately wide, diameter measuring ca. 25% of shell width, partly covered by thick callus; three broad, evenly spaced, elongated swellings on columellar part of callus.

Colour of teleoconch and protoconch white.

	TW	H	W	HA	H/W	H/HA
holotype	4.7	4.6	5.3	1.7	0.87	2.71
paratype MNHN 1	4.7	4.4	5.7	1.8	0.77	2.44
paratype MNHN 2	4.4	3.8	5.0	1.3	0.76	2.92
paratype MNHN 3	4.8	4.1	5.0	1.7	0.82	2.41
paratype MZB 1	4.6	3.8	5.0	1.6	0.76	2.38
paratype MZB 2	4.6	4.0	5.2	1.5	0.77	2.67
paratype RMBR 1	4.6	4.8	5.2	1.4	0.92	3.43
paratype RMBR 2	4.7	4.0	4.8	1.2	0.83	3.33
paratype CV	4.5	4.0	5.0	1.5	0.80	2.67
<i>means</i>	4.6	4.2	5.1	1.5	0.81	2.77

Table 7. - *Bathymophila aages* n. sp. : Shells measurements in mm for types.

Discussion. *Bathymophila aages* n. sp. is rather close to *B. graviga* Marshall, 1999 from New Zealand (Norfolk Ridge and Three Kings Rise) (Figs 75-77), but this species, also collected in New Caledonia and Vanuatu, is taller for a similar number of whorls, has a larger protoconch (about 430 µm), a conical spire and usually 1 or 2 granular spiral cords around the umbilicus.

In its distribution area, the new species may be compared to *B. callomphala* (Schepman, 1908), but this species, though apparently rather variable (see Marshall, 1999), has a very different shape with a more depressed spire with and a more rounded periphery, a larger protoconch and has no sutural ramp.

Etymology. Strong, unbreakable (Ancient Greek : ἀσφαλής) - with reference to the massive shell of the species.

Genus *Spectamen* Iredale, 1924

Type species: *Trochus philippensis* Watson, 1881 (by o.d.) - Recent, New South Wales.

Synonyms: ?*Zeminolia* Finlay, 1926; ?*Minolops* Iredale, 1929.

Distinctive features. The *Spectamen* species have a moderately to rather high spire with up to 6 convex, often shouldered whorls. Spiral cords are present and rather strong, with axial ribs (especially in the subsutural area). The umbilicus is deep, usually (but not always, see Australian species in Wilson, 1993) bordered by a more or less strong spiral cord. Radula (6-10)+1+4+1+ 4+1+(6-10), with a fourth spatulate lateral tooth and a well differentiated, rectangular latero-marginal plate (see Herbert; 1987).

Herbert (1987) did not decide if *Zeminolia* Finlay, 1926 and *Minolops* Iredale, 1929 are synonyms of *Spectamen*, waiting for anatomical comparison. Marshall (1999) suspects that the genus *Spectamen*

could be a synonym of *Solariella*, but, again, the absence of data about external anatomy of the type species of *Spectamen* make it difficult to decide on the only features of shell and radula.

Spectamen babylonia n. sp.

Figs 78-81, Table 8

Type material. Holotype (3.9 x 3.6 mm) MNHN (MNHN 21435). Paratypes: 2 MNHN (MNHN 21436), 1 MZB (MZB Lam.1992).

Type locality. Indonesia, Kai Islands, KARUBAR, stn DW18, 05°18'S, 133°01'E, 205-212 m.

Material examined. Indonesia, Kai Islands, KARUBAR, stn DW18, 05°18'S, 133°01'E, 205-212 m, 2 lv (holotype and paratype), 1 sub lv, 2 dd (paratype).

Distribution. Only known from the type locality.

Diagnosis. A solarielline species with a rather elevated spire, whorls with an horizontal ramp on shoulder, 3 spiral cords, the abapical smooth and making keel, a wide umbilicus with an angulate rim and a strong serrate spiral cord around it.

Description. *Shell* of small size (height up to 3.9 mm, width up to 3.7 mm), slightly higher than wide, rather thick, conical; spire moderately elevated, height 1.0x to 1.1x width, 0.9x to 1.1x aperture height; subangular periphery; umbilicus open, deep and wide.

Protoconch 280 µm wide, of 1 whorl, smooth with 3 very thin spiral threads, rather flat, without apical beak, with a weak, straight terminal lip.

Teleoconch up to 4.5 whorls; whorls convex, with horizontal subsutural ramp; thin smooth spiral cords on first whorl, thickening and granular or subgranular on next whorls.

Suture visible, slightly canaliculated.

First whorl convex, sculptured by 3 thin, evenly spaced, similar in size, smooth spiral cords appearing immediately; thin axial threads appearing at end of the whorl, prosocline with a strong slope (almost orthoelines), quickly thickening; interspace between threads similar in size to threads.

On second whorl, spiral cords stronger; P1 and P2 granular, P3 subgranular; axial threads thicker, producing beads at intersect with spiral cords; P4 appearing, weaker than P3 and sinking under suture at end of whorl.

On third whorl, P1 the strongest, P2 the weakest, both granular; additional axial threads between them, not connected to beads; P3 intermediate in size, producing keel, with more numerous and smaller beads connected by axial threads; P1 at shoulder, with horizontal subsutural ramp; sharp beads of P1 almost vertically oriented.

On last whorl, P3 almost smooth, P4 visible, slightly weaker than P3, smooth; P3 and P4 making double keel.

Aperture rounded, without thickening; peristome complete.

Base weakly convex, with 8 very thin smooth spiral cords and much broader, strongly beaded inner cord with 15 to 20 large sharp beads at angulate rim of the umbilicus; axial threads similar in size to outermost spiral cords.

Umbilicus wide, diameter measuring ca. 30% of shell width; strong axial lamellae within and about 5 beaded spiral cords, beads of abapical cord very sharp.

Colour of teleoconch and protoconch light beige, without maculations.

Operculum corneous, circular, multispiral with a short growing edge.

	TW	H	W	HA	H/W	H/HA
holotype	4.3	3.9	3.6	1.1	1.08	3.55
paratype MNHN 1	4.1	3.6	3.6	1.0	1.00	3.60
paratype MNHN 2	4.5	3.6	3.7	1.1	0.97	3.27
paratype MZB	4.5	3.8	3.6	0.9	1.06	4.22

Table 8. - *Spectamen babylonia* n. sp. : Shells measurements in mm for types.

Discussion. *Spectamen babylonia* n. sp. is close to *Minolia segersi* Poppe, Tagaro & Dekker, 2006 (Figs 93-100) from the Philippines, but this taller species has more spiral cords with a double median keel instead of a simple one, thicker and less crowded axial threads and much more spiral cords inside the umbilicus.

The new species may be compared to *Zetela dedonderum* Poppe, Tagaro & Dekker, 2006 (Figs 82-83) from the Philippines, but this species has stronger P1 and P3 with thicker beads on P1, secondary spiral cords, an only obsolete or even absent axial sculpture,

thicker and less numerous blunt beads around the umbilicus.

The new species also weakly resembles to *Spectamen geruloides* Herbert, 1987 from South Africa (from Natal to Transkei), but this taller species has 5 granular spiral cords more or less similar in size, a much weaker axial sculpture (mainly in the subsutural area) and a narrower umbilicus with only two spiral cords inside.

Etymology. Babylon (Latin), used as a noun in apposition - with reference to the staged shape of the shell, remembering a ziggurat like the Tower of Babel.

Figures 86-100. Scale bar = 5 mm.

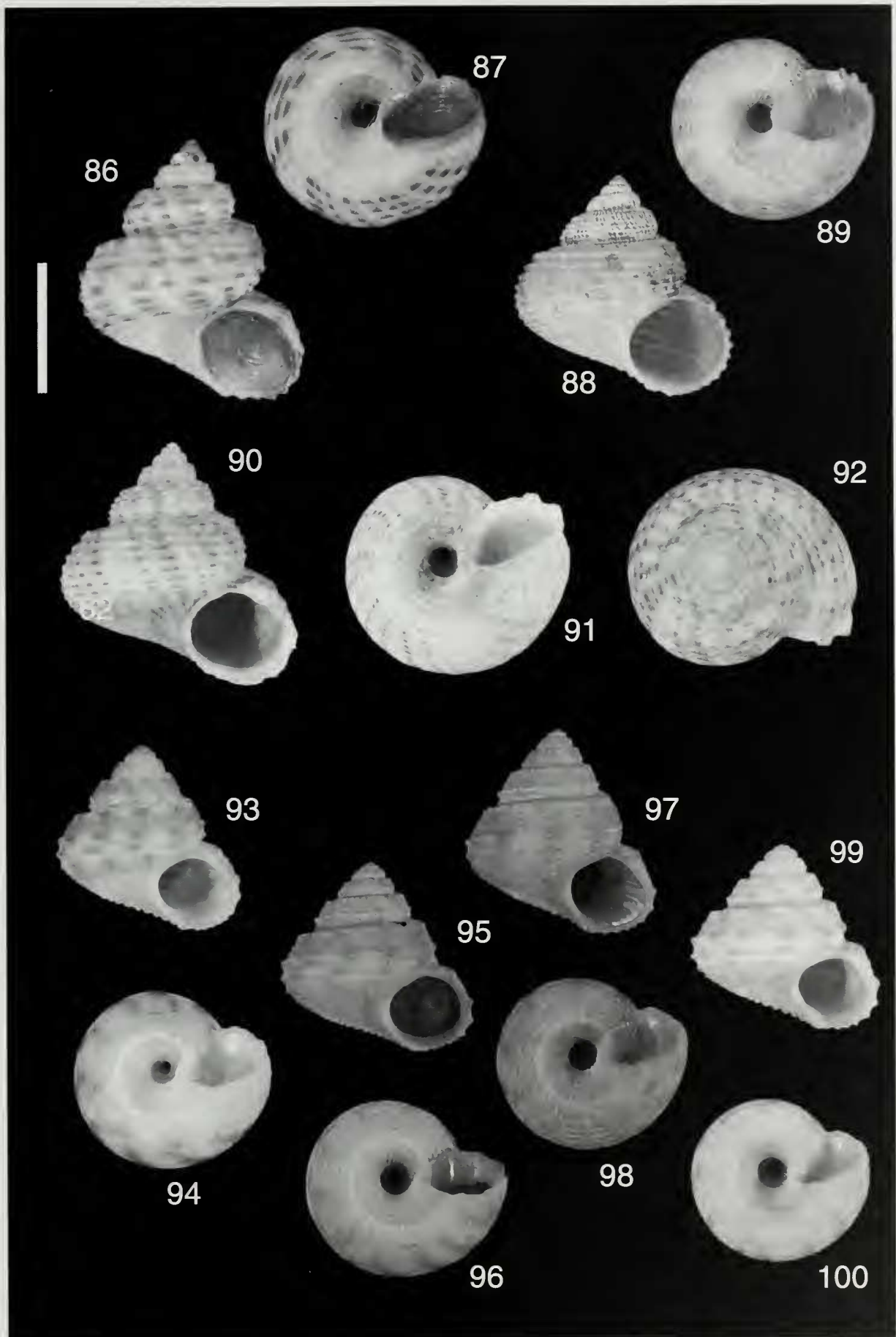
86-87. *Minolia punctata* A. Adams, 1860, Japan, 100 m, coll. C.Vilvens, 11.4 x 9.5 mm.

88-92. *Minolia gemmulata* Kuroda & Habe, 1971.

88-89. Holotype NSMT (Mo R17561), Japan, depth unknown, 8.7 x 8.3 mm. **90-92.** MNHN, Taiwan, South China Sea, 221 m [TAIWAN 2000, stn CP58], 11.3 x 10.5 mm.

93-100. *Minolia segersi* Poppe, Tagaro & Dekker, 2006.

93-94. Paratype MNHN (5369), Philippines, 60-100m, 6.0 x 6.1 mm. **95-98.** MNHN, Indonesia, Tanimbar Is., 206-210 m [KARUBAR, stn DW49]. **95-96.** 6.7 x 6.8 mm. **97-98.** 7.2 x 6.5 mm. **99-100.** MNHN, Indonesia, Kai Is., 181-184 m [KARUBAR, stn DW29], 5.6 x 5.8.



Genus *Zetela* Finlay, 1927

Type species: *Minolia textilis* Murdoch & Suter, 1906 (by o.d.) - Recent, New Zealand.

Synonym: ?*Lamellitrochus* Quinn, 1991.

Distinctive features. The *Zetela* species have as main conchological feature a reticulate sculpture resulting from the presence of spiral cords and axial threads; the beads of the cords are small to minute. The spire is moderately to rather elevated. The umbilicus is always open, usually rather narrow. There is no latero-marginal plate in the radula.

For the possible synonymy of *Lamellitrochus*, see Marshall (1999).

Zetela sp.

Figs 84-85

Material examined. Taiwan, South China Sea. TAIWAN 2000: stn DW45, 22°48'N, 121°28'E, 463 m, 1 dd.

Discussion. The single available shell (5.0 x 5.1 mm) is in very poor state and it seems almost impossible to describe the ontogeny of cords. It seems to be close to *Zetela kopua* Marshall, 1999, but smaller than this species.

Genus *Minolia* A. Adams, 1860

Type species: *Minolia punctata* A. Adams, 1860 (by o.d.) - Recent, Japan.

Distinctive features.

The shells of *Minolia* species are rather small to medium (up to 10 mm) with a moderately elevated spire (see type species Figs 86-87). The whorls are convex, with a canaliculate suture. The rounded aperture has no thickening; the peristome is complete. The broad, deep umbilicus is keeled by an usually serrate rim.

Minolia segersi Poppe, Tagaro & Dekker, 2006
Figs 93-100

Minolia segersi Poppe, Tagaro & Dekker, 2006: 132-133, pl. 72, figs 1-4. Type locality: Philippines, Aliquay Island, 50-150 m.

Material examined. Indonesia, Kai Islands. KARUBAR: stn DW15, 05°17'S, 132°41'E, 212-221 m, 12 dd. - Stn DW18, 05°18'S, 133°01'E, 205-212 m, 1 dd. - Stn DW22, 05°22'S, 133°01'E, 124-85 m, 5 dd. - Stn DW29, 05°36'S, 132°56'E, 181-184 m, 1 dd.

Indonesia, Tanimbar Islands. KARUBAR: stn DW44, 07°52'S, 132°48'E, 291-295 m, 1 dd. - Stn DW49, 08°00'S, 132°59'E, 206-210 m, 11 lv, 3 lv sub & 2 lv juv. - Stn DW50, 07°59'S, 133°02'E, 184-186 m, 1 dd sub. - Stn DW80, 09°37'S, 131°02'E, 199-201 m, 3 dd.

Distribution. Philippines, 100-224 m (after Poppe et al, 2006); East China Sea, 200 m (Poppe et al, 2006); Eastern Indonesia, 186-291 m, living at 206-210 m.

Remarks. The main characteristics of this species are :

- height up to 8.5 mm. width up to 7.5 mm;
- a rather elevated, stepped spire, a conical to slightly cyrtococonoidal shape with a subangular periphery, with up to 6 convex whorls;
- first whorl with 4 primary spiral cords similar in size and axial ribs; additional S2 cord and subsutural shoulder appearing on third whorl; on the last whorls, P1, P3 and P4 stronger than other cords; P1 granular with vertically oriented beads; P3 and P4 smooth or subgranular; P2 and S2 very thin, subgranular;
- a circular aperture with a complete peristome;
- a moderately convex base with about 6 subgranular to nearly smooth spiral cords, the innermost much stronger and granular around the umbilicus;
- a deep, rather wide umbilicus with a crenulated keeled rim, with about 6 granular spiral cords and thin axial thread inside;
- a base salmon colour with darker blotches on the thicker spiral cords.

The Indonesian specimens of this species match both the original description and the paratype in MNHN; the only slight difference is the presence of additional thin tertiary cords on the upper part of the last whorls. These new records extend its distribution.

Minolia gemmulata Kuroda & Habe, 1971

Figs 88-92

Minolia gemmulata Kuroda & Habe in Kuroda, Habe & Oyama, 1971: 26-27, pl. 12, fig 27. Type locality: Japan, Sagami Bay (Honshu), 50-200 m.

Minolia gemmulata - Higo, Callomon & Goto, 1999: 64.

Minolia gemmulata - Sasaki, 2000: 77.

Minolia gemmulata - Namikawa, Takeda, Hasegawa & Fujita, 2002:24.

Material examined. Taiwan, South China Sea. TAIWAN 2000: stn CP58, 24°35'N, 122°06'E, 221 m, 1 dd.

Remarks. The main characteristics of this species are :

- height up to 8.5 mm. width up to 8.5 mm;
- an elevated spire, a conical to slightly cyrtococonoidal shape with a subangular periphery, with up to 6 convex whorls;
- first whorls with axial ribs only; spiral cords appearing at third whorl, giving a reticulate surface and nodules at intersection of spiral and axial threads; whorls with a subsutural shoulder; about 8 spiral cords on last whorl, the cord at the shoulder the strongest, axial threads only still visible between suture

and shoulder, disappeared between other cords (this is the single feature given in the short original description to differentiate this species from *Minolia punctata* A. Adams. 1860);

– a weakly convex base with about 6 spiral cords, the strongest around the umbilicus; two inner cords granular, other cords nearly smooth;

– a deep, rather wide umbilicus without rim, with about 6 granular spiral cords;

– a light brown colour.

This species was only known from the type locality and this single record, that matches the holotype except it is a bit taller, extends its distribution.

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